



اونيورسيتي مليسيا فهغ  
UNIVERSITI MALAYSIA PAHANG



# UNDERGRADUATE COURSE INFORMATION 2022/2023

UNIVERSITI MALAYSIA PAHANG

*Teknologi  
untuk Masyarakat*

[www.ump.edu.my](http://www.ump.edu.my)



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**CENTRE FOR FOUNDATION AND PRA DIPLOMA**

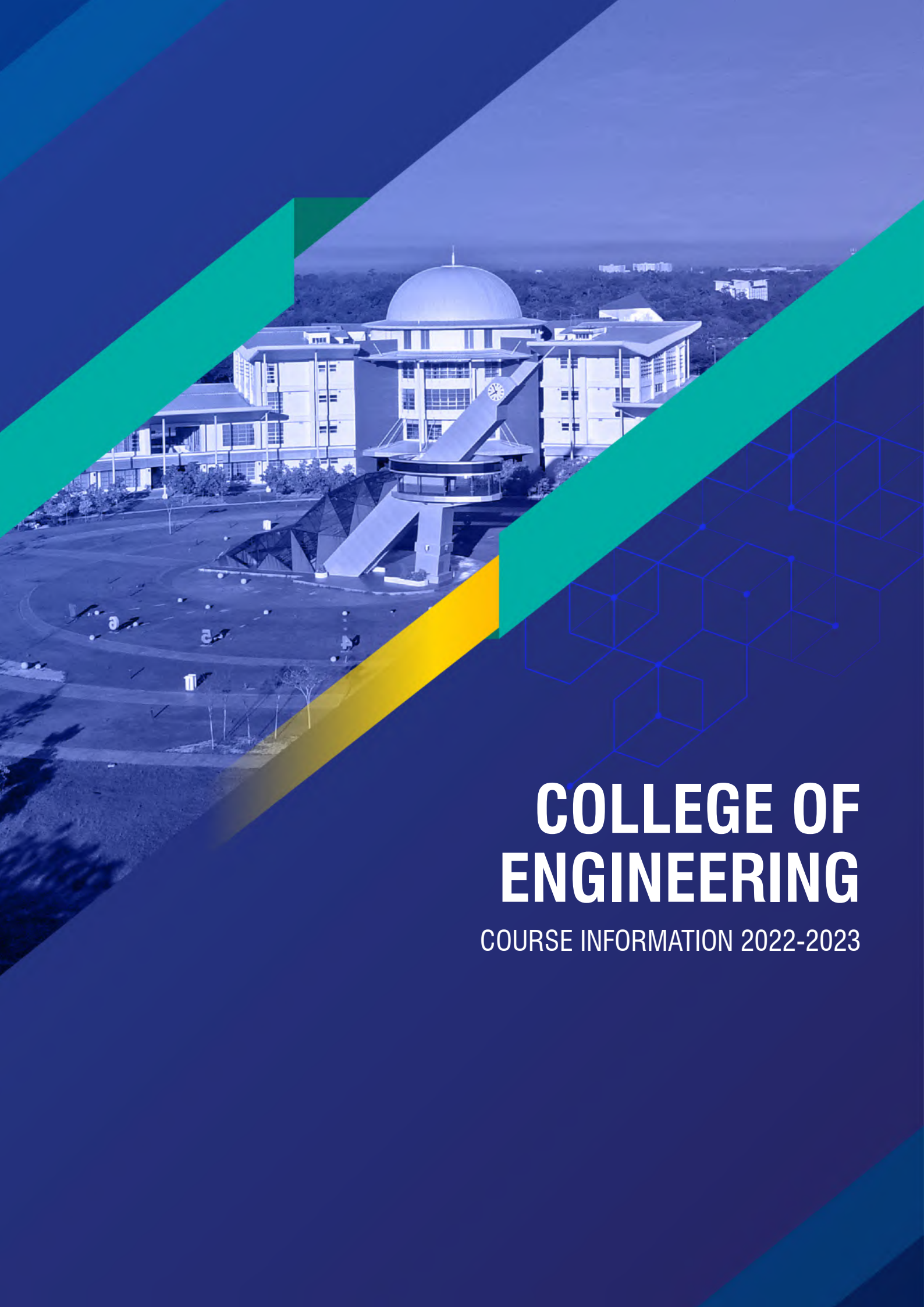
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# COLLEGE OF ENGINEERING

COURSE INFORMATION 2022-2023

## CURRICULUM STRUCTURE BACHELOR OF CHEMICAL ENGINEERING WITH HONOURS

YEAR	FIRST				SECOND				THIRD			FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	THIRD	FIRST	SECOND		
COURSES	UHL2412 English for Academic Communication	UHL2422 English for Technical Communication	UHF10*1 Foreign Language Level 1	UHS1022 Soft Skills	UHF2**1 Foreign Language Level 2	UHL2432 English for Professional Communication		BKC4543 Environmental Engineering	BKC4934 Integrated Design Project				
	UQB1**1 Co-Curriculum 1	UHC1012 Falsafah dan Isu Semasa	UHC2022 Penghayatan Etika dan Peradaban	BKC2453 Chemical Reaction Engineering I	BKC3002 Sustainable Energy	BKC3472 Chemical Reaction Engineering II	BKC3922 Undergraduate Research Project I	BKC4914 Process Synthesis	BKC4792 Chemical Engineering Lab IV				
	BUM2123 Applied Calculus	UQ*2**1 Co-Curriculum 2	BUM2413 Applied Statistics	BKC2343 Material & Energy Balance	BKC2433 Mass Transfer	BKC3922 Undergraduate Research Project I	BKC4944 Undergraduate Research Project II	BKC***3 3 <sup>rd</sup> Elective Subjects					
	BKC1253 Physical Chemistry	BUM2133 Ordinary Differential Equation	BKC2413 Chemical Engineering Thermodynamics	BKC1243 Analytical Chemistry	BKC3463 Unit Operation	BKC3732 Chemical Engineering Lab III	UGE2002 Technopreneurship	BKC***3 4 <sup>th</sup> Elective Subjects					
	BKC1752 Chemical Engineering Lab I	BKC1333 Thermodynamics	BKC2423 Heat Transfer	BKC2732 Chemical Engineering Lab II	BKC3413 Process Control & Dynamic	BKC***3 1 <sup>st</sup> Elective Subjects							
	BEL1113 Fundamental of Electrical Engineering	BKC1323 Organic Chemistry	BF11203 Material Science	KUK2142 Engineering Economics	BKC3492 Separation Process	BKC***3 2 <sup>nd</sup> Elective Subjects							
	BMM1563 Statics	KUK1213 Computer Programming for Engineers	BAA2313 Fluid Mechanics	KUK2443 Numerical Methods & Optimization	BKC3552 Process Simulation & Computer Aided Design	KUK3022 Engineering In Society							
					KUK3562 Occupational Safety & Health								
TOTAL CREDIT PER SEMESTER	17	17	18	18	18	16	5	15	12				
Note	UHL24** English Courses: UHL2400 Fundamentals of English Language, UHL2412 English For Academic Communication and UHL2422 English For Technical Communication. UHM2022 Ethics Relations: International Students (Starting cohort 2016/2017) must register UHM1012 Malaysian Studies (Pre-requisite). BUF1113 Basic Physics: Compulsory for new students who did not take Physics during Matriculation / Foundation Level.												
TOTAL CREDIT FOR GRADUATION	136												

**ELECTIVE COURSES FOR  
BACHELOR OF CHEMICAL ENGINEERING WITH HONOURS**

No	Code	Course	Credit Hour
1	BKB2413	Industrial Biotechnology (E)	3
2	BKB3413	Applied Biochemistry (E)	3
3	BKB3423	Bioreactor Engineering (E)	3
4	BKB3433	Downstream Processing (E)	3
5	BKB3443	Bioprocess Technology (E)	3
6	BKB3453	Bioprocess Development & Optimization (E)	3
7	BKG3453	Gas Processing & Liquefaction (E)	3
8	BKG3433	Gas Transmission & Distribution (E)	3
9	BKG4463	Gas Storage & Reticulation (E)	3
10	BKG3413	Combustion & Gas Utilization (E)	3
11	BKC3783	Oil & Gas Technology (E)	3
12	BKC3643	Industrial Safety Practices In Oil & Gas Sector (E)	3
13	BKC3713	Process Optimization (E)	3
14	BKC3863	Advanced Process Control (E)	3
15	BKC3723	Advanced Process Modelling & Simulation (E)	3
16	BKC3853	Process Monitoring (E)	3
17	BKC3883	Process Integration (E)	3
18	BKC4633	Polymer Design Technology (E)	3
19	BKC4673	Polymer Testing & Characterization (E)	3
20	BKC4713	Polymer Synthesis (E)	3
21	BKC4653	Polymer Technology (E)	3
22	BKC3693	Electrochemical Engineering (E)	3
23	BKC3683	Wastewater Treatment (E)	3
24	BKC3833	Recycling Technology (E)	3
25	BKC4683	Food Engineering (E)	3
26	BKC3653	Membrane Technology (E)	3
27	BKC4663	Ultrasonics (E)	3
28	BKC3893	Scale-Up of Chemical Process (E)	3
<b>Total Minimum Credits of Elective Courses For Graduation</b>			<b>9</b>

PEO	PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	PERFORMANCE INDICATOR
PEO1	Graduates are competent, practice professionalism and accomplish advanced standing in related engineering fields.	60% of graduates serving in engineering and technical profession. 5% of graduates promoted to higher positions in their organizations.
PEO2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% of graduates pursuing advanced degree or professional certifications.
PEO3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	70% of graduates registered with professional bodies 5% of graduates participating in local community network.

PROGRAMME OUTCOMES (PO)	
<p>Programme Outcomes describe what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviour that students acquire through the programme. Students of an engineering programme are expected to attain the following POs:</p>	
PO1	<p><b>Engineering Knowledge</b> Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems;</p>
PO2	<p><b>Problem Analysis</b> Identify, formulate, conduct research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (WK1 to WK4);</p>
PO3	<p><b>Design/Development of Solutions</b> Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (WK5);</p>
PO4	<p><b>Investigation</b> Conduct investigation of complex engineering problems using research-based knowledge (WK8) and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;</p>
PO5	<p><b>Modern Tool Usage</b> Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK6);</p>
PO6	<p><b>The Engineer and Society</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems (WK7);</p>
PO7	<p><b>Environment and Sustainability</b> Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts. (WK7);</p>
PO8	<p><b>Ethics</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);</p>



PO9	<b>Individual and Team Work</b> Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;
PO10	<b>Communication</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;
PO11	<b>Project Management and Finance</b> Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments;
PO12	<b>Life Long Learning</b> Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

## BACHELOR OF CHEMICAL ENGINEERING WITH HONOURS (BKC)

BKF1333  
Thermodynamics  
Credit : 3  
Prerequisite : None

### Synopsis

This course is designed to introduce basic concepts in thermodynamics in a thorough way. Topics cover are properties of pure substances, thermodynamics system, the first law of thermodynamics for closed systems, open systems and their application in steady-flow and unsteady-flow processes, the second law of thermodynamics, entropy, introduction to refrigeration and steam power plant.

### Course Outcomes

CO1: To discover the state of properties from property diagrams and obtaining data from property tables.

CO2: To solve the mass and energy balance of a process for both closed and open systems by using the first law of thermodynamics.

CO3: To analyse the efficiency of a system (e.g., heat engine, heat pump, refrigerator) and its technical feasibility using the second law of thermodynamics and entropy concept.

BMM1563  
Static  
Credit : 3  
Prerequisite : None

### Synopsis

An introduction to solving engineering static problems, involving: force vector, equilibrium of particle and rigid body, friction effect on rigid body equilibrium, structural analysis, frame and machines, centroids, center of gravity and moment of inertia.

### Course Outcomes

CO1: Analyze equilibrium of particle and rigid body.

CO2: Analyze equilibrium of rigid body involves friction and structural analysis.

CO3: Evaluate centroids and moment of Inertia, of composite cross-sectional area.

CO4: Demonstrate the solution of the problems.

BKF1253  
Physical Chemistry  
Credit : 3  
Prerequisite : None

### Synopsis

This course discusses some introductory to thermodynamics in physical chemistry followed by continuation topics related to liquids and their mixtures, principles of chemical equilibrium and rate reactions. The solid surfaces including their applications will also be discussed in this course. The development of key skills is facilitated by a program of tutorials and practicals.

### Course Outcomes

CO1: Explain and describe the principle of thermodynamics

CO2: Able to solve problem related

CO3: Ability to communicate effectively and presenting in related topic

BKF1323  
Organic Chemistry  
Credit : 3  
Prerequisite : None

### Synopsis

This course discusses the fundamental theory of the properties, synthesis and organic reactions where the functional group as a framework as a basic level courses with an organic chemical content. This course focuses on the key concepts of organic chemistry through a study of the reactions of selected nonfunctional aliphatic, alicyclic, cyclic and aromatic molecules. Particular emphasis is placed on the underlying mechanistic pathways that are involved and the stereochemistry of the molecular structure is also considered.

### Course Outcomes

CO1: Write and draw the common organic structure as per the IUPAC system

CO2: Describe the physical properties and bonding among the organic molecules

CO3: Write and explain reactions mechanism

and synthesis for different functional group

BKF1752

Chemical Engineering Lab I

Credit : 2

Prerequisite : None

Synopsis

In the basic engineering lab, students are required to perform laboratory works which cover the basic concepts of physical and chemistry such as concepts of solubility and miscibility, buffer effect, heat determination and gravimetric analysis of chloride. The lab also contains experiments which cover the basic concepts of engineering such as pressure change analysis, head losses in piping systems and material properties.

Course Outcomes

CO1: Relate the basic science and engineering theories with the corresponding experimental works.

CO2: Solve basic science and engineering knowledge calculations.

CO3: Demonstrate the concepts of basic science and engineering in solving problems and interpretation of experimental data.

CO4: Adapt the team working behavior and commitment as a member while working on the group assignment.

BEL1113

Fundamental of electrical engineering

Credit : 3

Prerequisite : None

Synopsis

This module will introduce students to basic science of electricity, introduction to instrumentation and measurement, work and energy theorem, basic AC and DC circuit and introduction to magnetism.

Course Outcomes

CO1: Identify knowledge of electrical engineering and its applications.

CO2: Analyze basic DC and AC circuits by using fundamental electrical knowledge.

KUK1213

Computer Programming for Engineers

Credit : 3

Prerequisite : None

Synopsis

This subject aims to introduce the fundamental element and feasibility of computer programming for engineers. The contents emphasize not only the theoretical knowledge of programming but also the practical implementation in real-life situations. Students will learn basic structure of computer programming including variables and data types, input/output instruction, assignment instruction, decision instruction, repetition instruction, functions, arrays, string and reading/writing from/to text files. Students will be taught on developing a program to solve general engineering problems, mathematical equations and displaying the data via 2D and 3D graphs.

Course Outcomes

CO1: Organize and analyze the data by using MATLAB.

CO2: Apply software to solve general chemical engineering and mathematical problems.

CO3: Demonstrate the ability to transform the problem to design and from design to an operational program

BKF2423

Heat Transfer

Credit : 3

Prerequisite : None

Synopsis

The objective of this course is to provide students with the concepts of heat transfer. This course will emphasize on the principles of the heat transfer in steady-state by conduction, convection and radiation. Subsequently, principles of the heat transfer in unsteady-state by conduction. Students will be exposed to the procedure for problem solving and its application on heat exchanger.

Course Outcomes

CO1: Understand the basic principles of heat transfer and solve problems related to thermal conduction in steady-state and unsteady-state

systems.

CO2: Analyze and solve problems related to convective heat transfer in a steady-state system.

CO3: Utilize the heat transfer principles and its design equations for heat exchanger calculation and design.

CO4: Solve problems related to radiation heat transfer in a steady-state system.

BKF2343

Material & Energy Balance

Credit : 3

Prerequisite : None

Synopsis

This course aims to equip students with basic chemical engineering principles such as different unit systems, unit conversion and process variables determination. This knowledge will then be applied extensively for material and energy balances for single or multiple unit operations of non-reactive and reactive chemical processes. In addition, computer applications using MS Excel to solve the material and energy balance also have been embedded in this course.

Course Outcomes

CO1: Solve the variables and properties related to material and energy balance problems.

CO2: Analyze and solve material balance of processes in nonreactive systems.

CO3: Analyze and solve material balance of processes in reactive systems.

CO4: Analyze and solve energy balance of processes in nonreactive systems.

CO5: Analyze and solve energy balance of processes in reactive systems.

CO6: Adapt the team working behavior and commitment as a member while working on the group project.

BKF2453

Chemical Reaction Engineering I

Credit : 3

Prerequisite : None

Synopsis

This subject covers the theory of reaction kinetics and basic reactor design. Prerequisite required for this subject is preferably general chemistry, thermodynamics, mathematics and material and energy balance. First, rate laws for single reaction and mole balance of various forms and modes of isothermal reactors are introduced and equated at ideal conditions. The rate law is mainly based on the power law model. The stoichiometric balance is also included. Next, the design of the isothermal reactor is formulated through an algorithm following steps of mole balance, rate law, and stoichiometry. Sizing of multiple reactors, catalytic reactor and unsteady state reactor are among the cases studied in the algorithm lesson that will additionally include pressure drop effect. Then, the students will learn to design multiple reactors. Terms such as selectivity and yield will be taught to optimize the reactor. Finally, the effect of heat due to reaction thermodynamics and heat exchange will be taught. Strategies such as limitation of conversion for adiabatic reactor and reactors in series with multistage heater/cooler in optimizing yield of reversible reaction will be taught.

Course Outcomes

CO1: Apply chemistry, thermodynamics and chemical reaction fundamentals such as reactant limitation, mole balance, rate law and stoichiometry in reactor design.

CO2: Design isothermal reactors for a single reaction

CO3: Analyze reaction and determine reactor scheme for desired selectivity and yield.

CO4: Design reactor under various heat effect or/and for multiple reactions

BKF2413

Chemical Engineering Thermodynamics

Credit : 3

Prerequisite : BKF1333

Synopsis

This subject mainly covers the topics of pure substances, heat effects, thermodynamics properties, VLE, thermodynamics solution and chemical reaction equilibrium. The course entails the theory and applications of

thermodynamics concept and deals with composition-dependent thermodynamics relations. This course requires conceptual thinking and requires greater mathematical sophistication to generate ideas and problem solving.

#### Course Outcomes

CO1: Solve equations of state or the generalized correlations for PVT properties and heat effects.

CO2: Analyse thermodynamics properties, phase equilibrium (VLE), solution thermodynamics and chemical reaction equilibrium problems using thermodynamics equations.

CO3: Design and solve flow sheet for a predetermined chemical process.

BAA2313

Fluid Mechanics

Credit : 3

Prerequisite : None

#### Synopsis

The objective of this course is to introduce the concept and use of fluid mechanics, both static and dynamic fluid. The topics covered are fluid properties, fluid static and dynamics, Bernoulli's equation and applications, momentum equation and its application, analysis of flow in pipeline systems and dimensional analysis.

#### Course Outcomes

CO1: Identify and describe the fundamentals of fluid mechanics.

CO2: Identify, analyze and find solutions to problems related to fluid mechanics.

CO3: Apply the concept of fluid mechanics to overcome chemical engineering problems.

BKF1243

Analytical Chemistry

Credit : 3

Prerequisite : None

#### Synopsis

The syllabus covers the basic knowledge and application of sample and data handling, calibration techniques, data evaluation and quality of analysis in analytical laboratories. It also deals with separation techniques and its

basic applications such as GC and HPLC. The introduction to the theory and application of spectroscopic techniques used in chemical analysis such as UV-Vis, FT-IR and AAS are discussed. The combinations of above techniques with their advantages are covered in this course.

#### Course Outcomes

CO1: Interpret and analyze analytical data to solve the problem related to analytical chemistry.

CO2: Explain and solve problems related to basic analytical techniques such as gravimetry, titrimetry, spectroscopic and chromatographic.

CO3: Explain the concept and application of analytical equipment such as GC, HPLC, UV-Vis., FT-IR, and AAS.

BFI1203

Material Science

Credit : 3

Prerequisite : None

#### Synopsis

This course is an introduction to materials science and engineering. Students are expected to have understanding on crystal structure, mechanical and physical properties of materials, phase diagram, phase transformation and the strengthening mechanism for metal alloys also application and processing of metals, ceramics, polymers and composites.

#### Course Outcomes

CO1: Analyse the materials structure, application, mechanical and physical properties of materials.

CO2: Analyse the phase diagram, phase transformation and the strengthening mechanism for metal alloys.

CO3: Evaluate various types of engineering materials (metals, ceramics, polymers and composites), their structure-properties relationship and processing method.

CO4: Analyse the characteristics of each engineering material towards environmental and sustainability.

**BKF2732**

Chemical Engineering Lab II

Credit : 2

Prerequisite : None

**Synopsis**

This lab is one of the most important labs in the chemical engineering study. In this lab, students will perform experiments to support their theoretical study of heat transfer and chemical reaction engineering. Experiments involved in this lab are shell and tube heat exchanger and plate heat exchanger. It also includes the experimental studies using different types of reactors for determining kinetic and RTD data.

**Course Outcomes**

CO1: Formulate relevant design equations for solving heat exchanger problems.

CO2: Design the experiments to acquire the kinetic and RTD data.

CO3: Estimate reaction order and specific reaction rate constant based on experimental data .

CO4: Inculcate good communication skills and team working spirit.

**KUK2142**

Engineering Economics

Credit : 2

Prerequisite : None

**Synopsis**

This course deals with cost analysis in engineering decision-making, the management aspects and control of complex projects. Engineering economics topics include cost estimation, time value of money, interest formulas and equivalence calculations, measures of investment worth, depreciation and income tax analysis.

**Course Outcomes**

CO1: To identify, formulate and analyze the economic feasibility of a plant, carried out by examining the capital cost and the manufacturing cost obtained from the cost estimation techniques.

CO2: To apply theoretical and conceptual knowledge of financial statements, money-time relationship, depreciation and after-tax economic analysis to solve engineering

economic problems.

CO3: To demonstrate understanding in the economic decision-making process by applying the knowledge in the individual and teamwork tasks.

**KUK2443**

Numerical Methods &amp; Optimization

Credit : 3

Prerequisite : BUM2133

**Synopsis**

This subject teaches the techniques by which mathematical problems are formulated so that they can be solved with arithmetic operations. Topics covered in this subject are roots of equation, systems of linear algebraic equations, optimization, curve fitting, numerical differentiation & integration, ordinary differential equation and partial differential equation. Some software packages are introduced to empower the students in problem solving.

**Course Outcomes**

CO1: Optimize a process employing numerical methods.

CO2: Evaluate the suitable numerical methods in solving engineering problems.

CO3: Solve optimization & numerical methods problems by using software packages.

**BKF2433**

Mass Transfer

Credit : 3

Prerequisite : None

**Synopsis**

This course is to provide students with the concepts of mass transfer. This course will emphasize on the principles of the mass transfer in gases, liquids, biological solutions and gels, and solids. Subsequently, the principles of unsteady state and convective mass transfer will be covered to establish knowledge of mass transfer. The students will be exposed to the procedure for general problem solving and its application on real systems.

**Course Outcomes**

CO1: Apply fundamental understanding of

mass transfer in diffusion phenomena in gas, fluid and solid systems.

CO2: Analyze and solve problems related to diffusion and convection mass transfer in steady/unsteady state.

CO3: Relate the concept of mass transfer in problems related to unit operations.

BKF3463

Unit Operation

Credit : 3

Prerequisite : None

Synopsis

The objective of this course is to provide students with concepts of separation processes and unit operation in chemical engineering. It will cover the gas-liquid, vapor-liquid, liquid-liquid and solid-liquid separation process. By completing the subject, students will understand the basic mechanisms, operations and basic design parameters of the selected unit operations such as evaporation, distillation, absorption, liquid extraction and leaching.

Course Outcomes

CO1: Understand the basic mechanisms, operations and basic design parameters of the selected unit operations

CO2: Analyze unit operation problems and evaluate the separator properties such as the number of stages, height or diameter.

CO3: Design an appropriate separator unit in a chemical plant.

BKF3413

Process Control & Dynamic

Credit : 3

Prerequisite : BKF2343

Synopsis

This is an introductory level course in chemical process dynamics and control. The topics that will be included in this subject are fundamentals and concepts of control system, development of theoretical and empirical model for chemical and physical processes, dynamic behavior of processes, application of

Laplace transform and transfer function, block diagram, design and analysis of control system, stability analysis, advanced process control and computer simulation/analysis.

Course Outcomes

CO1: Develop theoretical mathematical models and analyze dynamic behaviour for chemical processes.

CO2: Construct Piping and Instrumentation (P&ID) diagram.

CO3: Analyze feedback control system.

CO4: Demonstrate PID tuning and analyze stability of closed-loop systems.

CO5: Adapt the team working behavior and commitment as a member while working on the group project.

BKC3492

Separation Process

Credit : 2

Prerequisite : BKF2343

Synopsis

This course aims to introduce the principles of typical unit operations involved in chemical and petrochemical industry such as drying of process material, adsorption and fixed-bed separation, membrane separation, mechanical-physical separation and crystallization. At the end of this course, it is expected that the students will understand theories, principles, calculations and basic design parameters associated with every unit operation.

Course Outcomes

CO1: Explain, discuss and interpret the concept of unit operations i.e drying, adsorption, fixed bed separation, crystallization, membrane separation and mechanical-physical separation.

CO2: Analyze problems related to unit operation in chemical related processes.

CO3: Determine basic design parameters associated with certain unit operations.

CO4: Perform and appraise a literature search for technological change in separation equipment.

**BKF3552**

Process Simulation &amp; Computer Aided Design

Credit : 2

Prerequisite : BKC3463 &amp; BKC3492

**Synopsis**

This particular course will introduce the usage of process simulation and flow sheeting software to students, i.e.; Aspen Plus. This software will be used to simulate steady state models for chemical and oil and gas processes. This subject is very important to prepare students for future usage of the advanced modelling tool in chemical engineering and other related fields involving design and simulation.

**Course Outcomes**

CO1: Apply the software to model and simulate problems related to chemical engineering unit operations.

CO2: Analyse the chemical process based on the constructed flowsheet

CO3: Develop flowsheet to model and simulate problems related to chemical engineering processes and other related disciplines.

**BKF3472**

Chemical Reaction Engineering II

Credit : 2

Prerequisite : BKC2453

**Synopsis**

This subject furthers the knowledge of chemical reactors. Topics to be covered are the heterogeneous systems of the catalytic reaction, including the effects which significantly influence the reactor performance, the study of the real scenario for non ideal reactors in industries, and introduction of biochemical reaction systems. The analysis of industrial chemical reactors frequently requires solutions of non-linear algebraic and differential equations. Hence, modeling the nonideal reactor will be the crucial skill to fulfill the outcome requirement for each chemical engineer and researcher in chemical reaction engineering.

**Course Outcomes**

CO1: Explain the factors that affect the performance of industrial reactors such as diffusion, mixing and other limiting situations.

CO2: Apply the fundamentals of biochemical reaction systems.

CO3: Evaluate the performance of the reactor which is affected by diffusion and catalyst deactivation.

CO4: Predict the non-ideal reactor performance based on the residence time distribution data using an appropriate model.

**BKC3922**

Undergraduate Research Project I

Credit : 2

Prerequisite : None

**Synopsis**

This course is designed to expose the students to a research project. They have to apply all the knowledge they have learned in the program to complete the research project. Each student will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor). During the research project I, the students will be able to do a literature survey and prepare a draft which contains the objective of the project, problem statement, literature survey, solving techniques, methodology, preliminary results, treatment of results and list of reference publications. At the end of this subject, the students are required to present the draft in a short seminar which will be evaluated by a faculty's panel.

**Course Outcomes**

CO1: To apply knowledge of mathematics, natural sciences, engineering fundamentals or engineering specialization to the research problems.

CO2: To identify and analyse research problems using the principles of mathematics, natural sciences or engineering science.

CO3: To design and develop solutions based on research problems

CO4: To engage in independent and life-long learning in the broader context of technological change, enhance an individual's soft skill and organization skills in research activities.

CO5: To communicate effectively on research



outcomes with the engineering community and society (oral).

CO6: To communicate effectively on research outcomes with the engineering community and society (written).

BKF3732

Chemical Engineering Lab III

Credit : 2

Prerequisite : None

Synopsis

This laboratory course is offered to enhance students' understanding and application of theories learned in Chemical Engineering Unit Operation by doing experiments. This lab includes experiments on absorption, solid liquid extraction, drying, evaporation, crystallization, and distillation. The main objective of this course is to develop student skills of presenting their findings with logical scientific based reasoning orally and in writing. Besides that, students will be exposed to environment and safety precautions related to unit operation.

Course Outcomes

CO1: Describe the fundamentals of chemical engineering unit operation.

CO2: Applied chemical engineering knowledge on unit operation handling and calculation.

CO3: Write technical reports effectively with logical scientific based reasoning.

CO4: Present effectively as an individual and in a group for understanding the theoretical knowledge and application of chemical engineering unit operation.

BMM3022

Engineering in Society

Credit : 2

Prerequisite : None

Synopsis

This subject gives an overview of engineering, the profession and its requirements in Malaysia scenario. Topics that will include ethics, management and contribution of engineering also generic skills and study skills. Plant visit and seminar as an exposure to the real field of engineering.

Course Outcomes

CO1: Describe the understanding of engineering profession, accreditations and professional bodies.

CO2: Explain the ethics, public responsibility and the laws in engineering practise.

CO3: Display effective leadership and team working ability in completing the report and presentation.

KUK3562

Occupational Safety & Health

Credit : 2

Prerequisite : None

Synopsis

This course describes the processes of managing occupational safety and health (OSH) matters in an organization. It introduces the Malaysian OSH Acts and Regulations, OSH Standards, OSH programs that need to be carried out to minimize hazards, risks, accidents and health effects among workers at workplace in the organization.

Course Outcomes

CO1: Value fundamentals of technical safety for chemical and biotechnology industries.

CO2: Explain the various features of OSH management and regulations.

CO3: Review and analyze the cause and effects of industrial accidents and propose for improvement.

CO4: Evaluate OSH aspects in the design and operation of chemical and biotechnology industries.

CO5: Communicate effectively and present in OSH related topics.

BKC3002

Sustainable Energy

Credit : 3

Prerequisite : None

Synopsis

This course focuses on the sustainable energy fundamentals and application. It covers a wide area of renewable energy topics such as biofuels synthesis, biomass utilization, waste utilization and natural

resources. The environmental and socio-economic impact of renewable energy adoption is also discussed. Current challenges and progress in sustainable energy adoption is discussed.

#### Course Outcomes

CO1: To describe the fundamentals and main characteristics of biobased energy sources and analyse their environmental impact or challenges compared to fossil fuels.

CO2: To perform a conceptual design of biofuel energy systems that meet specific energy demands, are economically feasible and have a minimal impact on the environment. CO3: To perform the life cycle analysis of integrative sustainable energy systems.

BKI3655

Industrial Training

Credit : 5

Prerequisite : KUK3562 & BKF3463

#### Synopsis

In industrial training the students should gain insight into the industrial practice, in order to visualize the tasks and possibilities of their later occupation work. All students are required to undergo 10 weeks of industrial training during the end of the semester of the third academic year. The performance of each student during the periods of his/her Industrial training is evaluated jointly by the faculty staff, and the representatives from employer organizations. The student is required to maintain proper records and submit reports on the training received by him/her. The industrial training report should cover all periods of approved employment. The report document is expected to demonstrate development of practical and professional skills in Engineering through technical experience and application of theoretical knowledge. Development of skills in dealing with people, and communication skills are part of the subject objectives. The student should be able to present the report to the university supervisor, as a complement to their degree.

#### Course Outcomes

CO1: Display independency in actual working environment with minimal supervision  
CO2: Display communication skill with different levels of staff in the organization

CO3: Present technical documents related to the work completed

CO4: Practice positive attitude during the training

BKC4543

Environmental Engineering

Credit : 3

Prerequisite : None

#### Synopsis

This subject is designed to introduce to the students the principles and design techniques of environmental engineering. Topics include water quality parameters, water treatment, wastewater treatment, air pollution and solid waste treatment. This subject provides the fundamental scientific and engineering principles to improve and maintain the environment to protect human health, protect nature's beneficial ecosystems, and improve environmental-related enhancement of the quality of human life.

#### Course Outcomes

CO1: Understanding of water quality parameters and their relation to public health.

CO2: Review problems and design its solution involving water engineering treatment.

CO3: Ability to identify, formulate, and solve wastewater engineering problems.

CO4: Review problem and design its solution involving air pollution and solid waste engineering.

BKC4914

Process Synthesis

Credit : 4

Prerequisite : BKC3463, BKC2453, BKC3472, KUK3562 & BKC3552

#### Synopsis

This course guides students to design a process. Process is an integrated system, which has material and energy balance. It is not considered feasible for production of a chemical until its synthesis goes through steps of thorough review, selections and evaluation of successive unit operations. The challenge is when all calculations carried out are interconnected among them and considering numerous variables and a tremendous number of factors with respect to process

decisions. This course helps students understand the basic technique of process synthesis. The focus will be particularly given to the conceptual design method whereby the synthesis follows six (6) hierarchical steps of decision making on the process. Feasibility of selection and evaluated process is integrated with the economic potential method starting from the second step where material balance calculation begins. Six (6) steps of process decision include mode of operation, input-output structure, reactor-recycle schemes, separator trains, heat exchanger network and control. The simulation software will also be introduced to ease the calculation. The environmental impact possessed by the process would also need to be considered during the process synthesis. At the end of this subject, the students are expected to come out with their own process flow diagrams and piping & instrumentation diagrams whether as a grass-root plant or a retrofitted plant.

#### Course Outcomes

CO1: Describe relevant material properties, technologies and engineering fundamentals in process decision and design.

CO2: Evaluate decisions made in process synthesis.

CO3: Propose the scheme/type of unit operations and estimate their optimum design by using heuristics and rule of thumb.

CO4: Manage safety and health aspects of the process.

CO5: Manage environmental aspects of the process.

CO6: Comply ethics in design proposal.

CO7: Synthesize feasible design of process.

#### BKC4944

Undergraduate Research Project II

Credit : 4

Prerequisite : BKC3922

#### Synopsis

This subject is the continuation of the subject Research Project I. In this subject, the students are required to conduct the research, collect and analyze data, discuss the findings and form the conclusions. At the end of this semester, the students are required to produce a research project report and present it to the faculty's evaluation panel.

#### Course Outcomes

CO1: To apply knowledge of mathematics, natural sciences, engineering fundamentals or engineering specialization to the research problems.

CO2: To identify and analyze research problems using the principles of mathematics, natural sciences or engineering science.

CO3: To design and develop solutions based on research problems.

CO4: To conduct investigation on research problems including design of experiments, analysis and data interpretation, and conclusion.

CO5: To have good practices in laboratory and simulation.

CO6: To engage in independent and life-long learning in the broader context of technological change, enhance an individual's soft skill and organization skills in research activities.

CO7: To communicate effectively on research outcomes with the engineering community and society (written).

CO8: To communicate effectively on research outcomes with the engineering community and society (oral).

#### BKC4934

Integrated Design Project

Credit : 4

Prerequisite : BKC4914

#### Synopsis

In this course, students will carry out a plant design project to demonstrate the practical aspects in designing Chemical/Bio/Gas processing plants. The students will be divided into groups where they are expected to design Chemical/Bio/Gas processing plants. They will also apply their previous knowledge from Process & Plant Design 1 and other related subjects, in completing the design task given. Students will be assessed based on their individual performance, presentation and final report.

#### Course Outcomes

CO1: Analyze and propose solutions for project complex engineering problems.

CO2: Develop suitable solutions to the

complex engineering problem.

CO3: Design systems that include components or processes using modern tools in complex engineering problems.

CO4: Develop a suitable design system.

CO5: Work in a team effectively as an individual and in a group.

CO6: Instill critical thinking, independent. Rational inquiry and self-directed learning.

CO7: Implement the theory of management /finance principles and engineering to manage projects.

CO8: Identify current issues in engineering industries.

BKF4792

Chemical Engineering Lab IV

Credit : 2

Prerequisite : None

Synopsis

This laboratory covers both process control & instrumentation and environmental studies. For the first topic, the objective is to address the key engineering educational challenge of realistic problem solving within the constraints of a typical lecture-style course in process dynamics and control. Students will conduct experiments based on two major process operations which are based on computer simulation and plant experimental works. In computer simulation, students will simulate a case study using Simulated Process Control (SPC) based on Delta V software. The students also run the experiment using pilot plants available such as liquid flow and air mass flow measurement and control in this laboratory. For the second topic, the testing techniques of environmental engineering will be introduced. The techniques involved in environmental samples testing, and an ability to critically evaluate data from a sampling program. Both applications will encourage students to apply their process control and environmental engineering theories into practical terms and develop critical thinking among the group members.

Course Outcomes

CO1: Investigate the use of different measuring techniques using pilot plant experimental set up.

CO2: Study the effect of different control strategies on process performance using simulated process control software .

CO3: Able to identify the function of various analytical methods and equipments for wastewater analysis .

CO4: Write technical reports effectively with logical scientific based reasoning.

CO5: Adapt team working and commitment behavior.

BAA4412

Project Management

Credit : 2

Prerequisite : None

Synopsis

This subject introduces the concept of project management which will provide the students with the knowledge of managing projects. As an introduction, students will be given general information on project life cycle and management. Then they will be given exposure to different techniques of project scheduling, monitoring and resource management.

Course Outcomes

CO1: Describe the elements involved in project management & phases involved in project lifecycle.

CO2: Describe the different types of project organization & stakeholders in the project management.

CO3: Discuss and explain various planning tools and techniques that can be used for preparing a project programme.

CO4: Plan suitable techniques used for managing resources in a project.

CO5: Apply and develop project planning and scheduling tasks into appropriate planning software.

BKB3413

Applied Biochemistry (E)

Credit : 3

Prerequisite : None

Synopsis

The subject provides an overview of

fundamental concepts in microbiology, biochemistry and its application in biotechnology industries. The subject covers microorganisms, cell cultures, and major biomolecules in living systems. The student will be exposed to the metabolic pathway of aerobic respiration, enzyme catalyzed reaction, cell culture behavior and good manufacturing practices. The course will also emphasize on the laboratory skills which includes basic biology and biochemistry analysis.

#### Course Outcomes

CO1: Describe the cell properties, microbial growth characteristic and media selection.

CO2: Determine enzymatic reaction and describe the mechanism of enzyme regulation.

CO3: Demonstrate the knowledge in microbiology handling, cell cultures and biochemistry analysis.

#### BKB3423

Bioreactor Engineering (E)

Credit : 3

Prerequisite : None

#### Synopsis

This subject covers the basic concepts of microbial growth phase, growth kinetic, stoichiometry of microbial growth and bioreactor operational mode selection. This subject also emphasizes on the application of transport phenomena in bioreactor, sterilization and aseptic technique, scale up, monitoring and control of bioreactor.

#### Course Outcomes

CO1: Construct conceptual design of a fermentation process according to first, second and third levels of hierarchical process synthesis.

CO2: Solve the calculation regarding the culture kinetic in different fermentation modes, and the stoichiometry of cell growth and product formation.

CO3: Discuss different bioreactor designs and its related instrumentation and control.

CO4: Solve the calculation regarding the mixing, heat transfer and mass transfer in a bioreactor.

CO5: Solve the calculation regarding the sterilization in a bioreactor and analyse the effect of scale-up.

#### BKB3443

Bioprocess Technology (E)

Credit : 3

Prerequisite : None

#### Synopsis

This subject covers the basic concepts of bioreactor operational mode and its culture kinetics. This subject also emphasizes on the application of transport phenomena in bioreactor, scale up, monitoring and control of bioreactor. This subject also includes the introduction of the unit operations that are commonly employed to separate biological products. An idealized process of bioseparation consists of four phases which are the removal of insoluble products, the isolation of desired biological products or concentration, the purification and lastly, polishing of biological products. The basic methods that will be covered in this course include filtration, centrifugation, cell disruption, precipitation, extraction, adsorption, and chromatography. In addition, an overview on the complete train of bioseparation will also be introduced.

#### Course Outcomes

CO1: Discuss different bioreactor operational modes, designs, and its related instrumentation and control.

CO2: Solve the calculation regarding the culture kinetic in different fermentation modes.

CO3: Solve the calculation regarding the mixing and mass transfer in a bioreactor and analyse the effect of scale-up.

CO4: Differentiate four phases involved in bioseparation which are recovery, isolation, purification and polishing.

CO5: Explain the principles of each technique.

CO6: Justify the underlying reasons for choosing a particular technique, as well as suggest any related improvements.

#### BKG3453

Gas Processing & Liquefaction (E)

Credit : 3

Prerequisite : None

#### Synopsis

In this subject, two main parts including upstream and downstream processes of

natural gas are covered. The course mainly focuses on the treatment processes involved in transforming raw hydrocarbon gas produced from offshore fields into several valuable products. In fact, the natural gas processes such as hydrocarbon gas processing, conditioning and liquefaction are vital for meeting the pipeline specifications and customer requirements. The common natural gas processes, namely; dry or steam reforming of natural gas and Fischer-Tropsch synthesis (FTS) are also discussed in this subject.

#### Course Outcomes

CO1: Explain the socioeconomic effects of having a hydrocarbon gas industry and its related activities. Comprehend simple PFD of Gas Processing Plant for treating raw natural gas to become sales gas and NGLs.

CO2: Explain the main effect of the presence of impurities such as water, acid gases, heavier hydrocarbons and others in natural gas flow. Then, solve and decide the suitable type of treatment processes.

CO3: Explain the natural gas liquefaction process which involves refrigeration and perform related engineering calculations.

#### BKG3433

Gas Transmission & Distribution (E)

Credit : 3

Prerequisite : None

#### Synopsis

This course aims to provide fundamentals knowledge to design piping systems for oil and gas transmission and distribution. These include gas pipeline design, engineering, fabrication, installation, testing and commissioning, as well as the gas pipeline network analysis. Students will also be exposed to the requirements for installation, codes and standards used in the design and installation of gas systems. Other relevant topics such as welding, corrosion control, odorizer system and gas metering skids will also be introduced.

#### Course Outcomes

CO1: Design and evaluate the gas pipeline transmission and distribution system.

CO2: Calculate the pressure losses in a gas pipeline using several networking analysis methods.

CO3: Illustrate gas pipeline construction from acquiring the right of way up to the commissioning process.

#### BKG4463

Gas Storage & Reticulation (E)

Credit : 3

Prerequisite : None

#### Synopsis

This subject aims to enable students to identify various types of storing methods of liquefied petroleum gas (LPG), natural gases (NG) and liquefied natural gas (LNG). Besides that, the understanding of the gas reticulation system is provided. Students will be provided with a working knowledge to design the gas storage and reticulation systems.

#### Course Outcomes

CO1: Explain the fundamental concepts and characteristic of LPG, NG and LNG storage systems.

CO2: Analyze the gas load consumption, pipe and storage sizing, total of gas withdraw from LPG, NG and LNG storage and others related equipment.

CO3: Respond with the current issues in gas storage technology and development

CO4: Design LPG, NG and LNG storage system and its accompanying piping or reticulation system.

#### BKG3413

Combustion & Gas Utilization (E)

Credit : 3

Prerequisite : None

#### Synopsis

This course enables students to understand the concept of combustion, fuel properties & characteristics, explosion phenomena and other related terms. The course also covers the application of mass & energy balance calculation related to combustion products and other important requirements i.e. theoretical air ratio, flue gases etc. Students will be exposed to the burner conversion calculation & design which is applicable in industry application. Venting systems option was also being discussed based on the appropriate circumstances. The gas fuel utilization methods and system was introduced based on current scenario

application.

#### Course Outcomes

CO1: Explain the concept of combustion, fuel properties & characteristics, explosion phenomena and other related terms.

CO2: Perform mass and energy balance in combustion system and burner conversion calculation.

CO3: Classify types of gas burner and equipment, burner conversion design and related energy generated technologies.

CO4: Keep abreast with the current issues in gas utilization method and system.

#### BKC3783

Oil & Gas Technology (E)

Credit : 3

Prerequisite : None

#### Synopsis

This course introduces the concept of upstream, midstream and downstream activities of the oil and gas industry. By the end of this course, students should be able to identify and describe the main branches of petroleum exploration and exploitation activities such as geology, drilling, reservoir engineering and production. Students should also be able to explain the stages and process of hydrocarbon formation, how it is found and later produced. Exposure to the reservoir and production engineering calculations will be provided to illustrate the applications of engineering principles in oil and gas production activities. To complete the understanding of the oil and gas life cycle, the midstream and downstream aspects of the oil and gas industry such as, topsides facilities, refinery operations, gas processing, product transportation as well as economy aspects and current issues affecting the industry will also be covered.

#### Course Outcomes

CO1: Distinguish the fundamental concept of upstream, midstream and downstream

CO2: Estimate reservoir volumes and hydrocarbons in place and production calculations

CO3: Select and design separators based upon well construction, fluid properties and production scenario.

CO4: Evaluate the current issues and environmental effects in oil and gas industry

#### BKC3643

Industrial Safety Practices in Oil & Gas Sector (E)

Credit : 3

Prerequisite : None

#### Synopsis

This subject will help to increase the undergraduate student safety knowledge and awareness plus on top of that they will know the current practice in the oil and gas industries. Topics to be covered are as follows, Introduction to OSHA 1994 & EQA 1974 Acts.

i)PTW Systems i.e. cold work permit, hot work permit, vessel entry permit and excavation permit.

ii) Lock Out & Tag Out (LOTO), confined space, gas detection and energy isolation.

iii) Transportation and Distribution Safety (TDS).

iv) Behavior Based Safety (BBS) and PPE.

#### Course Outcomes

CO1: Relates and explains the various acts / legislation governing OSHA & EQA.

CO2: Used and apply the various permits to work (PTW) systems and knows the important PTW and minimum PPE requirement in the oil & gas industries.

CO3: Distinguished the Do's & Don't of safety practices in a running oil & gas plant.

#### BKC3713

Process Optimization (E)

Credit : 3

Prerequisite : None

#### Synopsis

This subject introduces and develops techniques in formulating and solving optimization problems. Emphases will be given in optimization basics, unconstrained and constrained optimizations, linear programming, non-linear programming, and mixed integer programming. Applications of those concepts will be found in solving optimization issues in chemical processes such as heat transfer, separation, fluid flow and reactor design and operation.

#### Course Outcomes

CO1: Explain optimization basics and the

scopes within the chemical processes  
 CO2: Formulate mathematical models to solve optimization problems in chemical processes  
 CO3: Use an optimization software i.e General Algebraic Modeling System (GAMS)  
 CO4: Execute, evaluate and perform sensitivity analysis for the developed optimization models

BKC3723  
 Advanced Process Modelling & Simulation (E)  
 Credit : 3  
 Prerequisite : None

#### Synopsis

This course will extend the knowledge and skills introduced in the course BKF3553 (Process Simulation and Computer Aided Design). Students will be exposed to the development and solving first principle model and empirical model of chemical processes. Computational tools such as Matlab and Aspen software will be applied to solve complex problems. This subject will prepare the students with advanced knowledge and skills involving modelling and simulating chemical processes.

#### Course Outcomes

CO1: Develop and solve first principle model using Matlab and Aspen software  
 CO2: Develop steady state and dynamics process model related to chemical engineering and simulating it in Aspen software  
 CO3: Perform sensitivity analysis and optimization study for process improvement using Aspen software  
 CO4: Adapt positive team working behaviour

BKC3853  
 Process Monitoring (E)  
 Credit : 3  
 Prerequisite : None

#### Synopsis

This is an introductory level course of statistical-based process monitoring, which includes univariate and multivariate-based systems. The topics covered are introduction to process monitoring, statistical process

control (SPC), multivariate statistical process monitoring (MSPM) and also industrial monitoring applications. In particular, the last chapter mainly exposes the students with a variety of applications of monitoring approaches as well as reviewing the issues of various monitoring extensions.

#### Course Outcomes

CO1: Critically discuss the essentials and benefits of applying process monitoring system for ensuring smooth as well as safe industrial operability  
 CO2: Apply as well as analyze the univariate monitoring performance based on the progression of the means and range charts of SPC framework  
 CO3: Comprehensively explain in writing as well as solve mathematically the principles of multivariate analysis based on complex monitoring problem of MSPM framework  
 CO4: Develop fault detection mechanism as well as perform investigation based on a specified case study by using Matlab  
 CO5: Conduct a critical review of the current industrial monitoring issues particularly on the MSPM extensions

BKC3883  
 Process Integration (E)  
 Credit : 3  
 Prerequisite : None

#### Synopsis

This course deals with the concept of process integration consisting of mass integration, heat integration and cogeneration. The course uses pinch analysis to achieve the maximum both energy and mass recovery. The course also explains the integration and combination of power and steam.

#### Course Outcomes

CO1: Discuss the need of chemical engineering graduates when they have to make an evaluation on energy consumption and estimate the energy recovery achievable.  
 CO2: Explain and propose alternative ways for energy and mass minimization and estimate the benefits for the industry.  
 CO3: Able to design the heat exchanger network for optimal design, the mass integration as well as the cogeneration network.



**BKC4633**

Polymer Design Technology (E)

Credit : 3

Prerequisite : None

**Synopsis**

This course is designed to provide an introduction to polymer design technology. It covers topics such as structure and elastic properties, viscoelasticity, yield and fracture, reinforced polymers, design and manufacture of polymer materials. Upon completion of the course, the students should be able to apply the essential knowledge on the polymer mechanical behaviors in designing the polymer-based products.

**Course Outcomes**

CO1: Explain the theoretical and conceptual basis on polymer design technology

CO2: Apply knowledge of the polymer materials, structure & properties and fracture.

CO3: Analyse the mechanical properties of polymers in the design and manufacturing process.

**BKC4673**

Polymer Testing &amp; Characterization (E)

Credit : 3

Prerequisite : None

**Synopsis**

This course is designed to introduce students to polymer testing and characterization for material development. It will cover various testing methods, standards and codes for polymer testing by its properties. Emphasize will be given to mechanical properties, thermal properties, physical properties, chemical resistance, degradation effects, flammability properties and electrical properties. The course also includes polymer characterization with different methods like spectroscopy and thermal analysis.

**Course Outcomes**

CO1: Describe the physical/chemical properties of the polymer materials and application.

CO2: Identify the appropriate experimental method for a particular characterization problem

CO3: Explain the basics, capabilities and limitations of structural, morphological, thermal and mechanical characterization

analyses.

CO4: Develop a work plan to solve a characterization problem and utilize some specific instruments for materials characterization.

**BKC4653**

Polymer Technology (E)

Credit : 3

Prerequisite : None

**Synopsis**

This course will provide in-depth knowledge of polymer science and technology. It will be a polymerization reaction, kinetics, reactor, synthesis and processing technique of different types of plastics, rubber and composites. It will also deal with the current issues on polymers. Upon completing this course, students will be able to explain how polymers are processed into end-products and can suggest specific applications for specific polymers.

**Course Outcomes**

CO1: Explain what polymers are and how they can be produced and how to control the properties of polymers .

CO2: How to manufacture the end product by using different manufacturing techniques.

CO3: Identify different applications on the basis of properties.

**BKC3693**

Electrochemical Engineering (E)

Credit : 3

Prerequisite : None

**Synopsis**

The course will cover the fundamental principles of electrochemistry, including electrochemical thermodynamics, kinetics, and corrosion. Students will be exposed to the application of these principles in electrowinning, electrorefining, electroplating, fuel cells, batteries, and production of fine chemicals. Students will be able to perform efficiency analysis in these systems. They will also be able to understand the differences between types of fuel cells and distinguish between electrochemical and chemical energy systems. For each of the above application areas students will learn the criteria used to determine their performance,

their current state of development, and their advantages/disadvantages.

#### Course Outcomes

CO1: Apply the fundamentals of electrochemistry to develop kinetic models and to elucidate the kinetic parameters of electrochemical reactions.

CO2: Design the electrochemical systems on the basis of the fundamentals of electrochemistry.

CO3: Evaluate the performance of electrochemical systems.

BKC3683

Wastewater Treatment (E)

Credit : 3

Prerequisite : None

#### Synopsis

This subject covers the basic concept of water and wastewater treatment methods that include physical, chemical, biological and advanced treatment methods. The physical, chemical and biological characteristics of water and wastewater are introduced briefly in this course. The project field work will be carried out for the students to get the exposure in this field.

#### Course Outcomes

CO1: Explain and discuss the methods that used to characterize water and wastewater in accordance with the engineering fundamentals and environmental legislation.

CO2: Analyze, estimate, compare and solve problems of water and wastewater using different methods/processing.

CO3: Describe, evaluate, formulate and design of the engineered system for water and wastewater purification based on sustainable development.

BKC3833

Recycling Technology (E)

Credit : 3

Prerequisite : None

#### Synopsis

This course aims to give a perspective on the use of chemical engineering knowledge in the recycling industry. Students will be taught on the overall issues of wastes, waste management and regulation related to it.

Emphasis will be given on the awareness of recycling activities in Malaysia and other parts of the world, showing the technologies involved in doing the recycling. Students will have the opportunity to prepare and present the market survey and business plan on a chosen topic of interest in recycling of waste material in Malaysia, which requires them to search for the most feasible recycling activity that can convince financial institutions to finance the project. Students are also required to visit a related recycling plant to understand the nature of the business. At the end of this course, it is expected that the students will be able to appreciate the importance of recycling, the nature of the recycling industry and bring the interest to them to venture into recycling business after completing their studies.

#### Course Outcomes

CO1: Explain, describe and interpret the issue of waste, waste management and regulation, and recycling activities.

CO2: Apply knowledge of chemical engineering in developing the recycling process suitable for a specific waste material.

CO3: Prepare market survey and business plan on recycling of waste material into high value-added products.

BKC4683

Food Engineering (E)

Credit : 3

Prerequisite : None

#### Synopsis

This course is designed to introduce the applications of certain unit operations in the processing of different types of food products. The principles and methods of heating and dehydration, refrigeration and freezing, are discussed with emphasis on their applications in the processing of dairy, fruit and vegetables, eggs, poultry, meat and fish products. The course will also provide an appreciation on the importance of food packaging, food safety and hygiene.

#### Course Outcomes

CO1: Discuss the current status and future trends of the food industry in Malaysia.

CO2: Apply and analyze the principles of dehydration in food products.

CO3: Discuss and elaborate on the production of refrigerated foods.

CO4: Elaborate on the materials used and roles of food packaging..

CO5: Discuss the importance of safety and hygiene in food production

BKC3653

Membrane Technology (E)

Credit : 3

Prerequisite : None

#### Synopsis

This subject is primarily to expose students to the membrane separation process which involves liquid and gas separation. The students will be taught the type of membranes (i.e. microfiltration, ultrafiltration, nanofiltration and reverse osmosis), membrane module and material, membrane manufacturing mainly for phase inversion technique other new techniques (interfacial polymerization, grafting, coating etc.) and a few concepts such as transport theory, concentration polarization, osmosis phenomenon etc. Membrane characterization and performance will be taught as well including physical characterization, number of modules, required membrane area for feed processing, etc. Some common case studies and applications will be delivered in this subject to expose the students to the current and future technology for membrane separation process (i.e. forward osmosis).

#### Course Outcomes

CO1: Understand the basic principle in membrane separation technology and the classification of membrane

CO2: Gain general information regarding the membrane manufacturing techniques, membrane characterization and membrane module design.

CO3: Know the current and future applications of membrane separation technique

BKC4663

Ultrasonics (E)

Credit : 3

Prerequisite : None

#### Synopsis

This course aims to introduce the complete fundamental physics of ultrasonics, describe in detail equipment and procedures for

chemical process systems. The principles of ultrasonics operations involved in chemical processes such as cleaning, machining, forming and joining, liquid atomization and droplet formation, agglomeration and flocculation, extraction process, demulsification of crude petroleum, miscellaneous chemical effects and applications, electrolysis and electroplating. At the end of this course, it is expected that the students will understand theories, principles, calculation for the basic mechanisms, basic design parameters and applications of ultrasonics and are able to solve chemical engineering problems related to them.

#### Course Outcomes

CO1: Explain the fundamentals of frequency, intensity and power of ultrasonics.

CO2: Review problems and its solving involving ultrasound processing technology.

CO3: Analyze wave propagation and associated phenomena for desired ultrasound wave fields technique.

CO4: Able to apply various analytical methods and operate ultrasonic horns for processing application and use of ultrasonics in non-destructive testing of metals for chemical processes using the analytical skills, modeling skills or engineering economics.

BKC3893

Scale-Up of Chemical Process (E)

Credit : 3

Prerequisite : None

#### Synopsis

This subject covers the aspects of scale-up of chemical and biological processes and commercialization.

The course introduces the basic concept and application of scale-up of chemical and biotechnology related processes. The topics covered in this subject are introduction to the theory of scale-up; modeling and simulation; pilot plant; reactor scale-up; unit operation scale-up; fine/specialty chemical processes scale-up.

#### Course Outcomes

CO1: Master the basic fundamentals of scale-up theory, and commercialization of R&D.

CO2: Acquire the analytical and modeling skills required for conversion of lab scale

processes to commercial scale.

CO3: Improve communication and teamwork skills through group assignments.

## CURRICULUM STRUCTURE BACHELOR OF CIVIL ENGINEERING WITH HONOURS

YEAR SEMESTER	FIRST			SECOND			THIRD			FOURTH	
	FIRST	SECOND	THIRD	FIRST	SECOND	FIRST	SECOND	THIRD	SECOND	FIRST	SECOND
	BAA 1113 Engineering Mechanics	BAA 1143 Mechanics of Materials	BAA 1441 Engineering Surveying Camp	BAA 2113 Theory of Structures	BAA 2022 Engineering Laboratory II	BAA 3113 Reinforced Concrete Design II	BAA3342 Environmental Management		BAA 4022 Undergraduate Research Project 1	BAA 4044 Undergraduate Research Project 2	
	BAA 1413 Engineering Surveying	BAA 1422 Engineering Drawing		BAA 2223 Soil Mechanics & Geology	BAA 2133 Structural Analysis	BAA 3233 Geotechnical Engineering	BAA 3413 Law of Contract & Estimation		BAA 4113 Steel & Timber Design	BAA 4**3 Engineering Elective 2	
	BAA 1122 Civil Engineering Materials	BAA 1432 Construction Engineering		BAA 2313 Fluid Mechanics	BAA 2422 Building Services & Maintenance	BAA 3243 Highway & Traffic Engineering	BAA 3022 Engineering Laboratory III		BAA 4034 Integrated Design Project	B** 4**3 Free Elective 1	
	KUK 1213 Computer Programming	BAA 1022 Engineering Laboratory I		KUK 2142 Engineering Economics	BAA 2323 Hydraulics	BAA 3313 Hydrology & Water Resources	BAA 3032 Engineering Laboratory IV		KUK 4412 Project Management	B** 4**3 Free Elective 2	
	UHL 2400 Fundamentals of English Language	UHL 2412 English For Academic Communication		KUK 2443 Numerical Methods & Optimization	BAA 2143 Reinforced Concrete Design I	BAA3332 Water and Wastewater Engineering	KUK 3022 Engineers In Society		BAA 4**3 Engineering Elective 1	UGE 2002 Techno Preneurship	
	UQB 1**1 Co-Curriculum 1	UHC 1012 Falsafah dan Isu Semasa		UHF 1**1 Foreign Languages Level I	BUM 2413 Applied Statistics	UHC 2022 Penghayatan Etika dan Peradaban	KUK 3562 Occupational Safety & Health				
	BUM 2123 Applied Calculus	BUM 2133 Ordinary Differential Equations		UQ* 2**1 Co-Curriculum II	UHL 2432 English For Professional Communication		UHE 3**2 Elective Social Science				
	UHS 1022 Soft Skills			UHL 2422 English For Technical Communication			UHF 2**1 Foreign Languages Level II				
<b>TOTAL CREDIT</b>	<b>17</b>	<b>16</b>	<b>1</b>	<b>18</b>	<b>18</b>	<b>16</b>	<b>16</b>	<b>5</b>	<b>14</b>	<b>15</b>	
<b>TOTAL CREDIT FOR GRADUATION</b>	<b>136</b>										

**ELECTIVE COURSES FOR  
BACHELOR OF CIVIL ENGINEERING WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BAA4213	Foundation Engineering	3
2	BAA4223	Transportation Engineering	3
3	BAA4433	Business For Engineering & Construction	3
4	BAA4323	Waste Management	3
5	BAA4123	Bridge Engineering	3
6	BAA4333	Advanced Hydrology & Water Resources	3
7	BAA4443	Building Information Modelling	3
8	BAA4283	Soil Improvement	3
9	BAA4263	Peat Soil Engineering	3
10	BAA4343	Applied Hydraulics Engineering	3
11	BAA4133	Finite Element Analysis	3
12	BAA4143	Advanced Concrete Materials	3
13	BAA4153	Earthquake & Wind Engineering	3
14	BAA4353	Advanced Water & Wastewater Treatment	3
15	BAA4453	Geographical Information System	3
16	BAA4293	Pavement Engineering	3
<b>Total minimum credits of elective courses for graduation</b>			<b>9</b>

PEO	PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	PERFORMANCE INDICATOR
PEO1	Graduates are competent, practice professionalism and accomplish advanced standing in related engineering fields.	60% of graduates serving in engineering and technical profession. 5% of graduates promoted to higher positions in their organizations.
PEO2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% of graduates pursuing advanced degree or professional certifications.
PEO3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	70% of graduates registered with professional bodies 5% of graduates participating in local community network.

<b>PROGRAMME OUTCOMES (PO)</b>	
<p>Programme Outcomes describe what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviour that students acquire through the programme. Students of an engineering programme are expected to attain the following POs:</p>	
PO1	<p><b>Engineering Knowledge</b> Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems;</p>
PO2	<p><b>Problem Analysis</b> Identify, formulate, conduct research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (WK1 to WK4);</p>
PO3	<p><b>Design/Development of Solutions</b> Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (WK5);</p>
PO4	<p><b>Investigation</b> Conduct investigation of complex engineering problems using research-based knowledge (WK8) and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;</p>
PO5	<p><b>Modern Tool Usage</b> Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK6);</p>
PO6	<p><b>The Engineer and Society</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems (WK7);</p>
PO7	<p><b>Environment and Sustainability</b> Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts. (WK7);</p>
PO8	<p><b>Ethics</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);</p>
PO9	<p><b>Individual and Team Work</b> Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;</p>
	<p><b>Communication</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;</p>
	<p><b>Project Management and Finance</b> Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments;</p>
	<p><b>Life Long Learning</b> Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change</p>

## **COURSE SYNOPSIS BACHELOR OF CIVIL ENGINEERING WITH HONOURS (BAA)**

BAA1113  
Engineering Mechanics  
Credit Hour: 3  
Prerequisite: None

### Synopsis

The subject in Engineering Mechanics is the fundamental of all courses in engineering, which requires students to have basic knowledge in both statics and dynamics. The emphasis is on the development and correct application of the fundamental concepts of rigid body mechanics. Topics covered for both statics & dynamics are force system resultants, condition of equilibrium, centroid & moment of inertia; force & acceleration and work & energy.

### Course Outcome

CO1: Analyze the concept of static mechanics system in two and three dimensions problems and solve it by applying the equilibrium condition.  
CO2: Determine the location of centroid and moment of inertia for a body of arbitrary shape.  
CO3: Analyze the kinematics of motion that involves force & acceleration and work & energy principle.

BAA1413  
Engineering Surveying  
Credit Hour: 3  
Prerequisite: None

### Synopsis

This subject will expose to the civil engineering students the role of survey engineering in their field. The subject topics encompasses introduction to the engineering surveying, surveying equipment, measurement unit, bearing/angle and distance measurement for horizontal control, coordinate system, area & volume calculation, mass transfer diagram & mass transfer measure and the final setting out for construction work.

### Course Outcome

CO1: Identify and describe the definition and the principle of engineering survey including the engineering surveying roles in civil engineering works [i.e. determination point location technique, coordinate system, read and understand the information shown in site plan].  
CO2: Describe the procedure to perform horizontal and vertical control based on related provision i.e. theodolite and traversing and leveling [angle, horizontal distance and vertical distance measurement and cogo computation].  
CO3: Understand the range of calculations that can be made with surveying data i.e. An ability to make a necessary calculation to fix position of forming a horizontal and vertical curve, area and volume of construction work project.

BAA1122  
Civil Engineering Materials  
Credit Hour: 2  
Prerequisite: None

### Synopsis

This course will enable students to demonstrate understanding in the fundamental properties of construction material. Students will learn the basic properties of cement, aggregate, water, admixtures, manufacturing of concrete, masonry, timbers, metals, and other construction materials. At the end of the course students should be able to identify the suitability of each material in a construction, analyse and provide basic solution to the problematic material, and recognize the importance of sustainability practice in construction material.

### Course Outcome

CO1: Demonstrate understanding in the fundamental properties of construction materials.  
CO2: Identify the suitability of one material in civil construction.  
CO3: Analyze and provide solutions to the problematic material in civil construction.  
CO4: Understand how the concept of sustainability applies to construction materials.

KUK 1213  
Computer Programming  
Credit Hour: 3  
Prerequisite: None

### Synopsis



The topics learned in this course are variables and data types, input/output instruction, assignment instruction, decision instruction, repetition instruction, functions, arrays, string and reading/writing from text files. The outcome of the course is described below.

#### Course Outcome

At the end of this course, the students should be able to:

CO1: Ability to write computer programs to solve computational problems.

CO2: Ability to map/visualize problems into computational framework.

CO3: Ability to read, analyze and understand computer program codes.

BAA1143

Mechanics of Materials

Credit Hour: 3

Prerequisite: Passed BAA1113 Engineering Mechanics

#### Synopsis

The aims of this course are the study of the behavior of engineering or structural elements subjected to loads. It provides an introduction on elastic stress and strain analysis, axial deformations and analysis of column. Thus, properties and behavior of engineering materials including stress-strain relations. This course also deals with the analysis of direct and torsional shear stresses and their deformation; shear force and bending moment of beam also the stresses in beams; transformations of stresses.

#### Course Outcome

CO1: Identify and analyze the state of stresses, strains and deformation response of elastic solids in the external loading and axially load assemblies and describe and determine the mechanical behavior of materials under load.

CO2: Illustrate and analyze the shear-moment diagrams accordingly calculate the bending and shear stress in determinate beams.

CO3: Identify and solve the principal stresses and angles in plane cases using analytical method and Mohr's circle.

CO4: Identify and calculate the stresses, deformation and twist of angle of a torsional bar.

CO5: Apply the Euler formula to determine the magnitude of the critical load of buckling column

BAA1422

Engineering Drawing

Credit Hour: 2

Prerequisite: None

#### Synopsis

The objective of this course is to teach civil engineering students the basic skills of civil engineering drawing and drafting by using a computer-aided design and drawing software. Autodesk product AutoCAD will be used throughout the course. The AutoCAD software is one of the most widely used design and drafting tools in the world. Students will be able to gain proficiency in AutoCAD software by creating/modifying plans, drawings, or design files used for a variety of civil and environmental engineering projects. Course topics may also include works of real field examples

#### Course Outcome

CO1: Use Autocad to draw foundation key plan, foundation schedules, column schedules, beams key plan, slab key plan and column key plan.

CO2: Use Autocad to draw foundation and column detailing of a two-storey administration building.

CO3: Use Autocad to draw beams and slabs detailing, reinforced concrete gutters details, apron details and rain water pipe details of a two-storey administration building.

CO4: Use Autocad to draw door and window schedule detailing of a two-storey administration building.

CO5: Use Autocad to draw roof detailing, front elevation, rear elevation, left elevation and right elevation of a two-story administration building.

BAA1432

Construction Engineering

Credit Hour: 2

Prerequisite: None

#### Synopsis

This compulsory and basic subject will introduce the students to the world of construction industry. As an introduction, students are given information on the current situations in construction industries including the main

person in-charge and their role in the project. The students will be taught the fundamental knowledge on elements involved in construction work process that would lead towards completion of strong and stable structure at the end of project. Students who are successfully complete this course will be equipped with basic and fundamental knowledge that a civil engineer should have.

#### Course Outcome

CO1: Explain the responsibilities of parties involved in construction project and construction work process including types of temporary work structure and equipment's used.  
 CO2: Explain the types of sub-structure and superstructure in building construction, retaining wall, highway and bridge construction.  
 CO3: Explain sustainable modern construction techniques.  
 CO4: Explain the application of quality control in construction project.

BAA1022

Engineering Laboratory I

Credit Hour: 2

Prerequisite: To be taken simultaneously with BAA1413 Engineering Surveying

#### Synopsis

This course will enable students learn appropriate skills to conduct practical fieldworks in the area of linear survey, theodolite traverse, levelling, topographical and site survey, curve ranging, computation and setting-out.

#### Course Outcome

CO1: Carry out and conduct linear survey fieldwork.  
 CO2: Carry out and conduct theodolite traverse survey fieldwork.  
 CO3: Carry out and conduct levelling survey fieldwork.  
 CO4: Carry out and conduct topographical and site survey fieldwork.  
 CO5: Carry out and conduct curve ranging, computation and setting-out survey fieldwork.

BAA1441

Engineering Surveying Camp

Credit Hour: 1

Prerequisite: Passed BAA1912 Engineering Surveying Fieldwork

#### Synopsis

This engineering surveying camp encompasses carrying out horizontal and vertical control survey, detailing survey to locate man-made and natural features, preparation of site plan, related computation and setting-out simple construction work.

#### Course Outcome

CO1: Organize a small survey work for project.  
 CO2: Practice the significant of survey work using engineering survey techniques based on related provision.  
 CO3: Use various survey instruments at site.  
 CO4: Write report effectively.

BAA2113

Theory of Structures

Credit Hour: 3

Prerequisite: passed BAA1143 Mechanics of Materials

#### Synopsis

In this course students will be introduced to the analysis of statically determinate and indeterminate structures. The course covers the fundamental concepts of determining the structural stability and determinacy, analysis of statically determinate beams and frames, trusses and arches. Also to determine the deflection of beam and truss, and the analysis of indeterminate beams and frames.

#### Course Outcome

CO1: Analyze the deflection and slope of determinate Beams  
 CO2: Analyze an indeterminate beams and frames to obtain the end moments  
 CO3: Analyze internal forces and compute deflection of determinate plane trusses  
 CO4: Analyze 3-pinned arch to obtain the internal forces

BAA2223

Soil Mechanics & Geology

Credit Hour: 3

Prerequisite: BAA1113 Engineering Mechanics

#### Synopsis

Soil Mechanics provides students with a basic knowledge of the fundamental concepts of soil behaviour and gives an introduction into general geotechnical engineering. The course describes: the relationship between soils and its geological origins and demonstrates the significance of the particles size distribution and mineralogy; soil description; phase relationships; classification of soil; compaction of soil; soil permeability and principle of effective stress; stress distribution and shear strength of soil.

#### Course Outcome

CO1: Recognize the problems given and draft the solutions by applying the soil and geotechnical fundamental.

CO2: Prepare appropriate table/graph/chart/diagram in order to overcome the problems/issues in soil.

CO3: Analyze the data, generate solutions and evaluate the results obtained.

BAA2313

Fluids Mechanics

Credit Hour: 3

Prerequisite: None

#### Synopsis

To introduce the fundamental principles of fluid mechanics, the basic equations governing fluid statics and fluid flow, and the methods of solving engineering problems related to fluid mechanics

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describe fluid properties and the fundamentals of Fluid Mechanics concept.

CO2: Analyze fluid mechanics system and devices such as capillary tube viscometer, falling ball viscometer, manometers, and piezometer.

CO3: Apply and analyze fluid mechanics theories such as Bernoulli's Theorem, Continuity Equation, Darcy-Weisbach Equation and Reynold's Number in Fluid Mechanics system.

CO4: Analyze the pipeline systems as related to civil engineering and its application for water distribution

KUK2142

Engineering Economics

Credit Hour: 2

Prerequisite: None

#### Synopsis

This subject covers the principles and applications of economic analysis in the field of engineering to make sound decision among alternatives.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Realize the importance and role of economic decision in final decision making process of engineering project.

CO2: Identify the sources of data, and analyze the cost and benefit (financial matter) of engineering project.

CO3: Analyze the time value of money problem and apply the principles and techniques of engineering economics for effective decision making among alternatives.

KUK2443

Numerical Methods & Optimization

Credit : 3

Prerequisite : BUM2133 Ordinary Differential Equations

#### Synopsis

This subject teaches the techniques by which mathematical problems are formulated so that they can be solved with arithmetic operations. Topics covered in this subject are roots of equation, systems of linear algebraic equations, optimization, curve fitting, numerical differentiation & integration, ordinary differential equation and partial differential equation. Some software packages are introduced to empower the students in problem solving.

#### Course Outcomes

CO1: Apply numerical methods as a problem-solving tool

CO2: Optimize a process employing numerical methods

CO3: Solve numerical methods problem by using MS Excel and MATLAB

CO4: Optimize a process employing MS Excel, Design Expert and MATLAB

**KUK2443****BAA2022**

Engineering Laboratory II

Credit Hour: 2

Prerequisite:

**Synopsis**

This course covers structure laboratory testing. The experiments are complimentary to the theory that students have learned in the classroom and also to expose them to the practice work at the construction industry.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Able to apply and conduct laboratory tests and use significant and limitations of properties based on related standard requirement.

CO2: Collect, analyze and interpret experimental data

CO3: interact professionally among themselves and able to use communication skills to transfer their findings in a formal report format.

**BAA2133**

Structural Analysis

Credit Hour: 3

Prerequisite: BAA2113 Theory of Structures

**Synopsis**

Structure Analysis is the continuity studies of the Theory of Structures course that exposes the advanced analysis in the civil engineering structures and laboratory works. The course focuses on analyzing the column, statically indeterminate trusses, arches and cables and determines the displacement by using the Stiffness Matrix method for trusses, beams and frames. The principles and methods used to meet the objectives are drawn from prerequisite courses in mechanics, physics and mathematics.

**Course Outcome**

On completion of this course, students should be able to:

CO1: Determine and construct influence lines for determinate beams.

CO2: An ability to analyze the trusses to

determine the internal forces and displacement of indeterminate plane trusses by using the Virtual Work Method

CO3: An ability to analyze the arches and cables to determine the reactions and internal forces in arches and cables

CO4: An ability to apply the Stiffness Matrix Method to determine the displacement in trusses, beams and Frames, hence to understand the principle of finite elements analysis.

**BAA2422**

Building Services &amp; Maintenance

Credit Hour: 2

Prerequisite: None

**Synopsis**

This course will provide the fundamental knowledge of engineering design of the building services and maintenance in building through a specific design project

**Course Outcome**

At the end of this course, the students should be able to:

CO1: Design and illustrate air flow system to the building by applying physical fundamentals of ventilation in building

CO2: Apply Application of Electrical Distribution Network System and Design a lighting and electrical application in a building system and Housing Development Area.

CO3: Apply appropriate techniques and analyses to the effective design of both drainage & sewerage systems in single building and Housing Development Area

CO4: Able to Calculate and design the water demand and pipe sizing systems for the water supply Housing Development Area.

CO5: Able to recognise and Design Fire Prevention & Fire Fighting System in Building

**BAA2323**

Hydraulics

Credit Hour: 3

Prerequisite: BAA2713 Fluids Mechanics

**Synopsis**

This course introduces the concept and use of equations for open drainage and flow analyses (uniform & non-uniform flow) in open channel. It also covers the various phenomena such as

hydraulic jump and backwater, specific energy and specific force concept application, analyses of hydraulics machinery principles and dimensional analysis & hydraulic similarity concepts. The application software package (such as: HEC-RAS) will be introduced in this course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the hydraulic principles and apply the fundamental concept in analyzing uniform and non-uniform flow in open channels.

CO2: Differentiate and analyze the Rapidly Varied

Flow (RVF) & Gradually Varied Flow (GVF) phenomena, then design the open channel for steady & unsteady flow cases using HEC-RAS Hydraulics Software.

CO3: Establish the dimensional analysis formulation and apply hydraulic similarity concepts in scaling analysis.

CO4: Discuss hydraulics machinery principles and apply the fundamental concepts in analyzing the performance of hydraulic pump.

BAA2143

Reinforced Concrete Design I

Credit Hour: 3

Prerequisite: BAA2113 Theory of Structures

#### Synopsis

This course covers the introduction of reinforced concrete design, the limit state principles, ultimate strength analysis and flexural design. Shear, bond and torsion, analysis and design of beams and solid slab, staircases and introduction to axial column design. Using codes require for design and detailing. Group design project for double story house.

#### Course Outcome

By the end of this course, students will have the ability to:

CO1: Analyze first principle for single and double reinforced concrete beam and design reinforced concrete beam in accordance to the relevant codes of practice in building design.

CO2: Analyze, design and detail reinforced concrete slab in accordance to the relevant codes of practice in building design.

CO3: Analyze, design and detail reinforced

concrete staircase in accordance to the relevant codes of practice in building design.

CO4: Analyze, design and detail reinforced concrete non-slender column in accordance to the relevant codes of practice in building design.

5. Design project of a double story house in group as project team work and apply relevant code of practice, manuals and software in the design and detailing of structural components in reinforced concrete structures.

BAA3113

Reinforced Concrete Design II

Credit Hour: 3

Prerequisite: BAA2213 Reinforced Concrete Design I

#### Synopsis

This course covers the design of column, foundation, retaining wall and introduction to prestressed concrete design and also typical design of a reinforced concrete building under the design project.

#### Course Outcome

On completion of this course, students should be able to:

CO1: Analyze structure framing and design reinforced concrete columns.

CO2: Analyze and design shallow foundations.

CO3: Analyze and design reinforced concrete cantilever retaining walls.

CO4: Describe the application and design of prestressed beams.

CO5: Design a four story building project.

BAA3233

Geotechnical Engineering

Credit Hour: 3

Prerequisite: BAA2513 Soil Mechanics & Geology

#### Synopsis

Geotechnical Engineering provides students with further discussion and explanation related to soil engineering. The course describes: Soil compression, consolidation and settlement, Lateral pressure of soil, Slope stability, bearing capacity of soil, Site Investigation and environment geotechnics.

#### Course Outcome

CO1: Describe the principal tests used to determine the compressibility parameters of soil and calculate consolidation, time for settlements of a foundation and embankment.

CO2: Describe theory of earth pressure and apply the theory in calculation and design of earth retaining wall structure.

CO3: Describe theory and calculate slope stability using slip surfaces and method of slices.

CO4: Describe theory and calculate the shear strength of soil

CO5: Describe the purpose and basic principle of soil investigation

CO6: Describe the purpose and basic principle of environmental geotechnics in civil engineering.

BAA3243

Highway & Traffic Engineering

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course is designed to introduce students on the basic understanding of highway & traffic engineering with an emphasis on the design standards that being used in Malaysia. Topic covers are Malaysian Road Network, Traffic Engineering Studies which includes fundamentals principles of traffic flow and Highway Capacity Analysis, Traffic Signal System, Road Geometric Design, Pavement Design and Pavement Management System.

#### Course Outcome

At the end of this course, the students should be able to:

CO1: Classifying various types of road and highways within road network system, recognize how different road user groups interact and the consequence for traffic engineering.

CO2: Explaining speed, volume and density relationship, analyzing highway capacity and LOS for interrupted and uninterrupted flow.

CO3: Carry out fundamentals of Road Geometric Design allowing for different terrains, horizontal and vertical alignments.

CO4: Identify the properties of pavement materials, its structural and characteristics, design the pavement according to the principle, evaluate pavement deterioration and assess

alternative maintenance schemes for highways including surface and sub-surface drainage system.

BAA3313

Hydrology & Water Resources

Credit Hour: 3

Prerequisite: BAA2713 Fluids Mechanics

#### Synopsis

This course will be introduced the application of hydrological theory to solve problem in water resources engineering. The knowledge in hydrology will be used in planning, development, management and design of water resources project. This course also introduces the knowledge of reservoir management, engineering economy and determination of water demand requirement in water resources planning.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Define and explain the basic concept of hydrology processes.

CO2: Analyze and solve rainfall, stream flow, flow routing, runoff, hydrograph, groundwater, evapotranspiration and infiltration problems using various methods.

CO3: Estimate peak discharge and propose urban drainage dimensions using MASMA (Urban Storm water Management Manual for Malaysia) and Probability Distribution.

CO4: Describe the physical characteristics of reservoir and propose the yield, capacity & reliability of reservoir.

CO5: Explain and analyze the elements in water resources planning such as the economic and financial feasibility of engineering projects and computation of water requirement for irrigation.

BAA3332

Water and Wastewater Engineering

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course covers the basic analysis and design that civil engineering graduates should know regarding water and wastewater

engineering. The course starts off by introducing the participants to how water and wastewater engineering contributes to sustainable development and the principles of sustainability that can be practiced in water and wastewater treatment works. Next, the participants are exposed to water quality parameters that are pertinent to the analysis of water samples. The second half of the course will focus on the design for the processes inside water treatment plants and wastewater treatment plants as well as the associated pipe/sewer networks.

#### Course Outcome

On completion of this course, students should be able to:

CO1: Able to connect the importance of water and wastewater engineering to sustainable development and humankind.

CO2: Able to classify water samples by analyzing relevant water quality parameters.

CO3: Able to design a simple water treatment/distribution system/component.

CO4: Able to design a simple wastewater treatment/collection system/component.

BAA3342

Environmental Management

Credit Hour: 2

Prerequisite: None

#### Synopsis

The subject introduces students with the concept of environmental management. The focus is to bring the students to discuss on various environmental pollution and approaches in solving environmental issues and problems which covers various topic from water, air, soil and waste. These include pollution control, prevention and environmental regulations as well as the implementation and concept of environmental impact assessment (EIA) and environmental management plan (EMP) in achieving sustainable development will also be among the important aspect of this subject. Upon completion, students should be able to demonstrate and apply the knowledge by the ability to identify specific pollution, control methods and the processes in preparing an environmental impact assessment (EIA) report and mitigation plan.

#### Course Outcome

On completion of this course, students should be able to:

CO1: Illustrate environmental issues (env pollution) and its impact.

CO2: Interpret the application of environmental assessment in assessing environmental pollution impact.

CO3: Apply environmental management plan in mitigating the env pollution to achieve sustainable development.

BAA3413

Law of Contract & Estimation

Credit Hour: 3

Prerequisite: None

#### Synopsis

The course covers topics of tendering, contract, condition of contract, contract administration/management, contract procurement, estimation, taking-off and the importance of information technology in estimation work.

#### Course Outcome

By the end of this course, students will have the ability to:

CO1: Describe and analyze the type of construction contracts and tender documents.

CO2: Differentiate types of contracts and propose the right suitable contract for the construction.

CO3: Describe and analyze the type of project delivery in construction.

CO4: Describe and apply the method of estimation to estimate the cost of construction projects.

CO5: Analyze and interpret the constructions data to estimate the cost involved in construction projects.

BAA3022

Engineering Laboratory III

Credit Hour: 2

Prerequisite: Taken BAA2713 Fluid Mechanics

#### Synopsis

This Engineering Lab III covers the laboratory testing for subjects Fluid Mechanics, Hydraulics, Hydrology & Environmental Engineering. These all experiments are complimentary to the basic theory that students

have learned in the classroom and also to expose them to the practical work at the real world application in civil engineering field.

#### Course Outcome

On completion of this course, students should be able to:

CO1: Able to apply and conduct laboratory tests and use significant and limitations of properties based on related standard requirement.

CO2: Collect, analyze and interpret experimental data.

CO3: Interact professionally among themselves and able to use communication skills to transfer their findings in a formal report format.

#### BAA3032

##### Engineering Laboratory IV

Credit Hour: 2

Prerequisite: BAA2513 Soil Mechanics & Geology, BAA2413 Highway & Traffic Engineering

#### Synopsis

This Engineering Lab IV covers Highway & Traffic and Soil Mechanics & Geotechnical laboratory testing. The experiments are complimentary to the theory that students have learned in the classroom and also to expose them to the practice work at the construction industry.

#### Course Outcome

CO1: Able to apply and conduct laboratory tests and use significant and limitations of properties based on related standard requirement.

CO2: Collect, analyze and interpret experimental data.

CO3: Interact professionally among themselves and able to use communication skills to transfer their findings in a formal report format.

#### KUK3022

##### Engineers in Society

Credit Hour: 2

Prerequisite: None

#### Synopsis

Qualified engineers of tomorrow will need to be

market conscious, commercially adept, environmentally sensitive and responsive to needs of society. They must also be good communicators, organizers and managers. Therefore, this course is designed to enrich the students and intended to introduce them to the professional practice of civil engineering, with emphasis on the roles of practicing engineers, professional practice organization, engineering ethics, professional registration and communication skills.

#### Course Outcome

This course will cover three scopes which is technology in society, organization of engineering society and communication. The course features several guest speakers and all are civil engineering practitioners and professional, providing the students an opportunity to interact with professionals in their major field of interest.

CO1: Adopt and show concern to professional, regulation and ethical responsibilities.

CO2: Ability to function as an individual, member or leader in diverse teams and multi-disciplinary settings

CO3: Ability to communicate effectively and write effective reports and make effective presentation

CO4: Adopt and show concern the relationship between technology, engineering, and safety issues

CO5: Ability to apply the aspects of project management and quality in engineering

#### KUK3562

##### Occupational Safety & Health

Credit Hour: 2

Prerequisite:

#### Synopsis

This course describes the processes of managing occupational safety and health (OSH) matters in an organization. It introduces the Malaysian OSH Acts and Regulations, OSH Standards, OSH programs that need to be carried out to minimize hazards, risks, accidents and health effects among workers at workplace in the organization.

#### Course Outcome

- Apply the principles and system



requirements of Occupational Safety and Health in organisation

- Evaluate Occupational Safety and Health management programs related to the hazards
- Perform the investigation on industrial accident
- Prepare safety management program to organization

#### BAA4015

##### Industrial Training

Credit Hour: 5

Prerequisite: BAA3023 Project Management in Construction, BAA3012 Law of Construct & Estimation, BAA3513 Geotechnical Engineering, BAA2723 Hydraulics, BAA2213 Reinforced Concrete Design I

##### Synopsis

This course involves placement of students in relevant industry for approximate 10 weeks duration to get real-world working experience. Every student will be assigned an advisor/lecturer from the faculty who will co-operate with the industrial counterpart. At the end of the industrial training, students need to submit report. In addition, the respective industrial counterpart need to evaluate and provide comments on the students performances. CIDB structured module will be used as a part of evaluation.

##### Course Outcome

On completion of this course, students should be able to:

CO1: Behave according to organizations regulation and procedures while performing to basic professional skill during the available duration.

CO2: Practice and contribute taught theories to solve real time problem through involvement in various scopes of works such as planning concept, design, construction & project administration.

CO3: Adjust to professional and quality work ethics in order to become an effective, motivated and responsible engineer.

CO4: Communicate effectively on complex civil engineering activities such as being able to comprehend and write effective reports and design documentation and make effective presentations.

#### BAA4022

##### Undergraduate Research Project 1

Credit Hour: 2

Prerequisite:

Student Year 3 and above

Subject related to the research area must be **taken** before registering for URP 1 (BAA4022)

##### Synopsis

Students are required to attend a research workshop at the beginning of the course, where they will be taught on how to do research; research methodology, conducting literature review, data sampling, collection, analysis, and interpretation. Students will be guided by their respective supervisors on how to plan for the research, which will be conducted later in PSM 2 course. Students will have to carry out weekly discussion with their supervisors on the research topic, objective, scope, research program, and the extent of the development of the research proposal. A report and a presentation of the research proposal are required at the end of the course.

##### Course Outcome

At the end of this course, the students should be able to:

CO1: Select topic, identify the objectives, categorize the scope of works and prepare schedule for the implementation of a civil engineering related projects

CO2: Choose, review, discuss and interpret issues and problems related to particular project by conducting adequate literature review.

CO3: Choose, propose, employ, and develop or formulate the appropriate methodology to carry out the experiment and or data collection as to achieve the objectives of an engineering project.

CO4: Demonstrate, describe, discuss, illustrate, argue and predict about the selected topic, objectives, project approach, schedule, budget and expected outcomes for an engineering project in an oral presentation.

CO5: Solve and meet all deadlines and project commitments.

#### BAA4113

##### Steel & Timber Design

Credit Hour: 3

Prerequisite: BAA2123 Structural Analysis

### Synopsis

This course covers the analysis and design steel structures to EC3 for beams, column, connections, trusses, compression members and tension members. This course is also covered an introduction to Timber design to MS544.

### Course Outcome

At the end of this course, the students are expected to fulfil the following course outcomes:

CO1: Analyse & design beam according to the relevant code of practice in building design.

CO2: Analyse & design column according to the relevant codes of practice in building design.

CO3: Analyse & design steel trusses in according to the relevant codes of practice in building design.

CO4: Analyse & design steel connection in according to the relevant codes of practice in building design.

CO5: Analyse and design a typical timber structure

CO6: Communicate effectively within a team designing a multi-story steel building project using appropriate design software and modern tools to produce a report and present the project according to a given time.

BAA4034

Integrated Design Project

Credit Hour: 4

Prerequisite: BAA2113 Theory of Structures, BAA3213 Reinforced Concrete Design II

### Synopsis

This course is a Capstone Design Project that offering experience in multidisciplinary project-based learning. This course is design to ensure minimum proficiency and equipment of the upcoming graduate. This course is conducted with numbers of partners from industry which is involve the engineer, architect, surveyor, town planner, contractor, etc. in the direction of giving real exposure to the student. This course provides an opportunity for students to integrate and apply their knowledge learn in the class. This course comprises a comprehensive group design project and a series of seminars from expert.

### Course Outcome

On completion of this course, students should be able to:

CO1: Able to develop and propose planning layout for new development area that fulfilling all the necessary requirement from local authorities

CO2: Able to design, construct and scheduling proper planning for the new project development

CO3: Able to design and produce structural detailing

CO4: Able to estimate the costing for the project

CO5: Able to generate proposal for project development

CO6: Able to justify all the proposal in final presentation.

KUK4412

Project Management

Credit Hour: 2

Prerequisite: None

### Synopsis

To introduce the concept of project management which will cover the life cycle of the projects, roles of project manager, type of project organization, resources management, techniques of planning and scheduling, monitoring and controlling and types of software for project planning and scheduling that have been practiced in construction industry.

### Course Outcome

CO1: Explain the concept of project management and project life-cycle.

CO2: Describe and explain role of project manager as an important person in construction project.

CO3: Describe and explain role of project manager as an important person in construction project.

CO4: Differentiate and apply methods and techniques of resource management.

CO5: Examine and apply the appropriate techniques of project planning, scheduling, monitoring and controlling.

BAA4044

Undergraduate Research Project 2

Credit Hour: 4

Prerequisite: passed BAA4022

### Synopsis

This course is designed to expose students to research project. Students ought to apply the knowledge they have learned in the program to complete the research project. Every student will be supervised by an academic in doing literature survey and preparing part undergraduate thesis which contains objective of the project, problem statement, literature survey, methodology, preliminary results and references. At the end of this subject, the students are required to present their findings to their supervisor and faculty's panel.

BAA4213

Foundation Engineering

Credit Hour: 3

Prerequisite: BAA3513 Geotechnical Engineering

#### Synopsis

Focuses on geotechnical design of shallow and deep foundations, including spread footings, mats, driven piles, and drilled piers. Coverage includes bearing capacity, settlement, group effects, and lateral load capacity of the various foundation types. Additional topics include subsurface exploration, construction of deep foundations, and analysis of pile behavior using wave equation and dynamic monitoring methods.

#### Course Outcome

On completion of this course, students should be able to:

CO1: Designing Shallow Foundation based on Bearing Capacity Analysis

CO2: Designing Shallow Foundation Based on Settlement Analysis

CO3: Mat Foundation

CO4: Designing Pile Foundation

CO5: Designing Sheet Pile

CO6: Designing Braced Cuts

BAA4223

Transportation Engineering

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course is designed to introduce students to fundamental aspects in transportation engineering. The topics covered include four

step travel demand models, traffic management and public transport.

#### Course Outcome

At the end of this course, the students should be able to:

CO1: Evaluate transport related problems using theoretical and/or practical calculations and observations.

CO2: Assess the performance of infrastructure or public service provision and recommend improvement.

BAA4433

Business for Engineering and Construction

Credit Hour: 3

Prerequisite: None

#### Synopsis

The module provides an introduction to Business Skills for Engineers in Construction practice. It highlights how management theory and established practice. It highlights how management theory and established practice and procedures are applied to support the non-core business of an organisation. It also develops an understanding of the requirement of a contractor in relation to the management of services which support an organisation.

#### Course Outcome

CO1: Apply Business philosophy in Construction Sector relate to construction economy, market system and basic concept of economy in the market system.

CO2: Explain the related legal system in the country and their potential contribution to construction environment.

CO3: To evaluate the project management life cycle, construction accounting and financial management used this in making decision and sets out to explain this key aspect of business.

CO4: To evaluate the potential enhancements to systems and techniques

CO5: Analyses overall project planning and cash flow analysis for construction project.

BAA4323

Waste Management

Credit Hour: 3

Prerequisite: None

### Synopsis

Waste management is the module focuses on waste management such as solid waste management. In this module student will be exposed on the regulation, processes and design for safe waste management begin from generation, storage, and transportation until disposal of solid waste. In this subject, the students will be introduced to the sustainability technique of waste management such as the application of Life Cycle Assessment (LCA). It is important for student to learn and understand this subject in order to develop clean and safe environment for human and health.

### Course Outcome

CO1: Apply the engineering fundamental for solving practical waste management challenges  
 CO2: Demonstrate their ability to research existing and emerging technologies for the treatment of waste and recovery of value from waste.  
 CO3: Apply the role of decision making tools in the assessment of waste issues such as Life Cycle Assessment (LCA) and appreciate the role of recycling.  
 CO4: Summarize the increasing importance of waste management in achieving environmental sustainability and able to demonstrate waste minimization and monitoring system in solid or hazardous waste for environmental concern and public health.

BAA4123

Bridge Engineering

Credit Hour: 3

Prerequisite: BAA2213 Reinforced Concrete Design I

### Synopsis

This course covers on prestressed concrete bridge design, prestressing system, loss of prestress for bridge beams, analysis and design of section for flexural, shear and also principles and design of prestressed concrete members for prestressed concrete bridge. The course also covers prestressed concrete one-way slab and two-ways slab design for prestressed concrete bridge.

### Course Outcome

CO1: Able to design prestressed concrete

beam with prestressing tendon for bridges

CO2: Able to design deck slabs and calculate prestressed losses, deflection, camber for concrete bridges

CO3: Able to design piers and shear reinforcement for concrete bridges

CO4: Able to design anchorages, pile caps and foundations for bridges

CO5: Able to conduct overall design for serviceability limit state and ultimate limit state and use CIVILFEM softwares for bridges design.

BAA4333

Advanced Hydrology & Water Resources

Credit Hour: 3

Prerequisite: BAA3713 Hydrology & Water Resources

### Synopsis

This course is to provide students with the knowledge in advanced hydrological methods towards water resources problems. It equips the students with the skills on techniques of hydrological and water resources data analysis, modelling and prediction. This course begins with advanced methods in runoff model, hydrograph analysis and flood routing analysis. Other topics will be covered are probability and frequency analysis, the introduction of Urban Storm water Management Manual for Malaysia (MSMA) in storm water quantity control and water resources management including water uses, policy and regulation, system and economics analysis of water resources system. The knowledge in this course will be used in planning, development, management and design of water resources project.

### Course Outcome

CO1: Apply and analyse the rainfall runoff relationship and flow routing using multiple components and methods

CO2: Analyse and evaluate the various approaches in probability and frequency distribution in the hydrological data analysis

CO3: Analyse and design the storm water quantity control such as detention pond and infiltration facilities using Urban Storm water Management Manual for Malaysia Second Edition (MSMA2) and software

CO4: Evaluate and relate the characteristics and applications of water resources management in various water related projects.

BAA4443  
Building Information Modelling  
Credit Hour: 3

#### Synopsis

This course focuses on theoretical and technical knowledge of Building Information Modelling (BIM). The theoretical aspect emphasises on the fundamental concept of BIM. It covers the three crucial elements of People, Process and Technology. In the process element, the student will learn about the different stages of BIM delivery. Additionally, BIM standards and BIM manual of work process are also included to provide a better understanding. In the people elements, the focus of teaching concentrates on different responsibilities of BIM associated roles. It covers the function of each role to deliver the BIM scope of work effectively. Lastly, the technology elements focus specifically on the technical aspect of BIM. It will cover four interconnected activities of delivery to use 3D Parametric Authoring Tools. (INPUT, SETUP, MODELLING, OUTPUT) . At the end of the class, the students should be able to produce 3D Information rich BIM models.

#### Course Outcome

On completion of this course, students should be able to

CO1: Analyze complex engineering structures using truss, beam, plane stress and plane strain equations for static and dynamic structural analysis, heat transfer, fluid flow and electrostatic analysis

CO2: Apply finite element techniques to perform simulations of structures subjected to static and dynamic loading, heat transfer, and fluid flow through porous media

CO3: Analyze complex engineering structures using Finite Element Software

CO4: Develop finite element formulations as well as solution algorithms for various types of analyses, structural elements and materials

BAA4283  
Soil Improvement  
Credit Hour: 3  
Prerequisite: BAA2513 Soil Mechanics & Geology, BAA3513 Geotechnical Engineering

#### Synopsis

This course deals with the principles of ground improvement and soil stabilization. Among the topics covered are mechanical compaction, preloading and vertical drain, dynamic deep compaction, vibro compaction and replacement, grounding, deep soil mixing, earth reinforcement, tiebacks, soil nailing and sustainability in ground improvement.

#### Course Outcome

At the end of this course, students should be able to:

CO1: Apply the principles, application and design procedure for various soil methods.

CO2: Calculate theoretical/numerical calculation and field observation of performance to evaluate rationality of a particular soil/ground improvement procedure applied.

CO3: Evaluate alternative solutions and evaluate their effectiveness in solving problems.

BAA4263  
Peat Soil Engineering  
Credit Hour: 3  
Prerequisite:

#### Synopsis

This course deals with recognizing and understanding the behaviour of tropical peat soil in comparison to mineral type of soils. Because of the increasing demand to utilize marginal sites due to economic, political or/and environmental reasons, peat and organic soil has been a part of many present day civil engineering projects. This is especially true for the modern day urban development. A civil engineer is often required to have general knowledge in this aspect.

#### Course Outcomes

CO1: Understand the principles, applications, and design procedures for various types of peat and organic soil conditions.

CO2: Investigate rationality of a particular peat and organic soil improvement procedure applied using analytical/theoretical/numerical calculations and field observations of engineering performance.

CO3: Evaluate alternative solutions and their effectiveness before, during and after construction in peat ground.

BAA4343

Applied Hydraulics Engineering  
Credit Hour: 3  
Prerequisite: BAA2723 Hydraulics

#### Synopsis

This course is to provide students with the advanced principles in applied methods towards hydraulic problems. It covers application and analysis of urban storm water facilities, sedimentation processes and erosion problems which will equip the students with the skills on techniques of hydraulics analysis. Few examples and case studies from the MSMA 2nd Edition will be introduced as a guideline to assist and expose student in real world applications.

#### Course Outcome

- CO1: Define and analyze the hydraulics concept of uniform and non-uniform flow in open channels and the hydraulics machinery principles
- CO2: Apply and design the roof property drainage, rainwater harvesting system and on-site detention facilities
- CO3: Classify and determine the pavement drainage and the drain and swales for urban storm water management
- CO4: Identify and analyze the sedimentation & erosion process and recommend the suitable erosion & sediment control plan (ESCP).
- CO5: Define and calculate scour at piers and abutments.
- CO6: Classify and discover the characteristics and application of hydraulics structures in various water related project.

BAA4133  
Finite Element Analysis  
Credit Hour: 3  
Prerequisite: BAA2123 Structural Analysis

#### Synopsis

This course will expose to students various techniques in analyzing common structures using stiffness methods, truss equations and beam equations. Students are taught how to analyze frame structures using frame and grid equations. In addition, finite element analysis procedures such as plane stress, plane strain stiffness equations and linear-strain triangle equations will be delivered in class. Axisymmetric elements and isoperimetric formulations are second last topic

for this course. Towards the end, students will learn various ways in analyzing three-dimensional stress and use finite elements software - ANSYS to solve structural engineering problems.

#### Course Outcome

- CO1: Able to analyze common structures using stiffness methods, truss equations and beam equations.
- CO2: Able to analyze frame structures using frame and grid equations
- CO3: Able to analyze finite element using plane stress, plane strain stiffness equations and line restrain triangle equations
- CO4: Able to analyze axisymmetric elements and isoperimetric formulations
- CO5: Able to analyze three-dimensional stress and use finite elements software - ANSYS to solve structural engineering problems

BAA4143  
Advanced Concrete Materials  
Credit Hour: 3  
Prerequisite:

#### Synopsis

This course will introduce the students to the concepts, characterization, application and advantages of the recent concrete technology in construction as well as concrete durability in detail. The early part of the course will cover on the utilization of blended cement in concrete technology before introducing the student to the special concretes made using Portland cement and concrete produced not using Portland cement. The course will also touch on the durability aspect of concrete in terms of causes of deterioration, mechanism of attack as well as method to overcome the problem. Others topics that will also be included are quality control for durability of concrete and repairs of concrete structures.

#### Course Outcomes

- CO1: Analyze and differentiate the contribution of pozzolanic material as partial cement replacement towards properties of concrete compared to ordinary Portland cement
- CO2: Differentiate the properties and utilization of special types of concrete made of Portland cement
- CO3: Analyze the problems faced by concrete

in terms of durability, mechanism of attack and ways to problem.

CO4: Outline the quality control for durability of concrete and various methods of repair for concrete failure

BAA4153

Earthquake and Wind Engineering

Credit Hour: 3

Prerequisite:

### Synopsis

This course enables students to understand the mechanism of earthquake and its hazard. The damages on buildings caused by earthquake as well as seismic design for reinforced concrete building also will be covered in this course. Students also will be exposed to the meteorological of wind and its effect of buildings and environmental. Besides, this course also covering the simulation and design considering wind load. In order to give better understanding and practice, students will conduct group project to design four to ten storey reinforced concrete building with consideration of wind and seismic load.

### Course Outcomes

Describing the earthquake and wind hazard and their impact on buildings and environment.

CO1: Investigation and design of reinforced concrete beam and column with seismic provision to Eurocode 8.

CO2: Analyze and design four to ten story reinforced concrete building with earthquake and wind load consideration by using computer software.

CO3: Developing the design response spectrum using simple programming and exposure to computational fluid dynamic.

BAA4353

Advanced Water and Wastewater Treatment

Credit Hour: 3

Prerequisite: BAA3613 Environmental Engineering

### Synopsis

This course aims to extend and deepen the scope of the water and wastewater treatment engineering. The purpose of this course is to provide and educate students the theory and

practices of advanced technologies for water and wastewater treatment. The syllabus is designed to include the topics on water treatment engineering (water characteristics, water quality, conventional water treatment process, advanced water treatment technologies and water reuse) and wastewater treatment engineering (wastewater characteristics, effluent quality standard, conventional wastewater treatment process, advanced wastewater treatment technologies and wastewater reuse).

### Course Outcome

CO1: Apply the fundamental of engineering to solve the engineering problems related to water and wastewater process engineering.

CO2: Analyse the requirement and system design which address practical of advanced technology for the treatment of water

CO3: Analyse advanced wastewater treatment components and systems to determine overall process and individual unit effectiveness

CO4: Evaluate the increasing importance of water and wastewater management in achieving environmental sustainability.

BAA4453

Geographical Information System

Credit Hour: 3

Prerequisite: None

### Synopsis

The goal of this course is to give knowledge and understanding about application of GIS in Civil Engineering. The main content of this course is about an application of GIS in Civil Engineering. Amongst the main topics discussed are: Fundamental and development of GIS in civil engineering

Data processing such as data capture, data management, spatial analysis, data manipulation and data output.

Current application of GIS (focus in Malaysia)

### Course Outcome

By the end of semester, students should be able to:

CO1: Student will be able to identify and describe the main component of GIS and advantages of GIS in civil engineering.

CO2: Student will be able to explore about the

data capture, processing and organization spatial data.

CO3: Student will be able to analyze and solve the spatial problem.

CO4: Student will be able to use GIS software.

BAA4293

Pavement Engineering

Credit Hour: 3

Prerequisite: None

### Synopsis

This course is designed to will develop the knowledge and experience of the students in pavement design construction. This course comprises the following topics: Factors influencing thickness design, methods of pavement design: AASHTO, Asphalt Institute, ATJ5/85 (2013), Rigid pavement design, Interlocking block design, surface dressing design, construction of various pavement types, earthworks, cut slopes, embankments, surface drainage, subsurface drainage, road maintenance and rehabilitation, erosion control, slope protection, culverts.

### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the factors that influence the pavement design characteristic.

CO2: Design flexible, rigid and block pavement including surface dressing.

CO3: Explain and analyse the construction of pavement.



## CURRICULUM STRUCTURE BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS

YEAR SEMESTER	FIRST		SECOND		THIRD		FOURTH		
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	
	BEL1113 Fundamental of Electrical Engineering	BEL1123 Circuit Analysis 1	KUK2443 Numerical Methods & Optimization	KUK2142 Engineering Economics	KUK3562 Occupational Safety & Health	KUK3022 Engineers in Society	KUK4412 Project Management	BEL4724 Undergraduate Research Project 2	
	KUK1213 Computer Programming for Engineers	BEL1233 Analog Electronics	BEL2123 Electromagnetic Fields Theory 1	BEL2323 Principles of Control Systems	BEL3213 Signals & Systems	BEL3413 Electrical Installation Design	BEL4413 Electrical Power Generation and High Voltage Engineering	BEL4**3 Engineering Elective 2	
	BEL1233 Digital Electronics	BEL1133 Instrumentation & Measurements	BEL2113 Circuit Analysis 2	BEL2133 Electromagnetic Fields Theory 2	BEL3111 Engineering Design Principle	BEL3423 Power System Analysis	BEL4423 Power System Operation & Control	KEB4**3 Free Elective 1	
COURSES	UHL2412 English for Academic Communication	UHL2422 English for Technical Communication	BEL2313 Principles of Communication Systems	BEL2413 Electrical Power System	BEL3513 Electrical Machines	BEL3523 Power Electronics	BEL3715 Industrial Training (I) 10 Weeks	KEB4**3 Free Elective 2	
	UQB1**1 Co- Curriculum 1	UQ*2**1 Co- Curriculum 2	BEL2612 Electrical Engineering Laboratory 1	BEL2622 Electrical Engineering Laboratory 2	BEL3612 Electrical Engineering Laboratory 3	BEL3622 Electrical Engineering Laboratory 4	BEL4712 Undergraduate Research Project 1	UGE2002 Technopreneurship	
	BUM2123 Applied Calculus	BUM2133 Ordinary Differential Equation	UHL2432 English for Professional Communication	UHS2022 Soft Skills	UHC2022 Penghayatan Etika dan Peradaban	BEL3724 Integrated Design Project	BEL4**3 Engineering Elective 1		
	UHF11*1 Foreign Language Level 1	UHC1012 Falsafah dan Isu Semasa	UHF21*1 Foreign Language Level 2	UHE3**2 Elective Social Science	BUM2413 Applied Statistics				
TOTAL CREDIT	16	17	17	17	16	17	5	16	15
TOTAL CREDIT FOR GRADUATION	136								

**ELECTIVE COURSES FOR  
BACHELOR OF ELECTRICAL ENGINEERING WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BEL4433	Power Quality	3
2	BEL4443	Renewable Energy System	3
3	BEL4523	Power System Protection	3
4	BEL4223	Embedded Controller Technology	3
5	BEL4213	Rapid Digital System Prototyping	3
6	BEL4313	Microwave Engineering	3
7	BEL4453	Forensic Engineering	3
<b>Total Minimum Credits of Elective Courses For Graduation</b>			<b>12</b>

PEO	PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	PERFORMANCE INDICATOR
PEO1	Graduates are competent, practice professionalism and accomplish advanced standing in related engineering fields.	60% of graduates serving in engineering and technical profession. 5% of graduates promoted to higher positions in their organizations.
PEO2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% of graduates pursuing advanced degree or professional certifications.
PEO3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	70% of graduates registered with professional bodies 5% of graduates participating in local community network.

**PROGRAMME OUTCOMES (PO)**

<p>Programme Outcomes describe what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviour that students acquire through the programme. Students of an engineering programme are expected to attain the following POs:</p>	
PO1	<p><b>Engineering Knowledge</b> Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems;</p>
PO2	<p><b>Problem Analysis</b> Identify, formulate, conduct research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (WK1 to WK4);</p>
PO3	<p><b>Design/Development of Solutions</b> Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (WK5);</p>
PO4	<p><b>Investigation</b> Conduct investigation of complex engineering problems using research-based knowledge (WK8) and research methods, including design of experiments,</p>

	analysis and interpretation of data, and synthesis of information to provide valid conclusions;
PO5	<b>Modern Tool Usage</b> Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK6);
PO6	<b>The Engineer and Society</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems (WK7);
PO7	<b>Environment and Sustainability</b> Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts. (WK7);
PO8	<b>Ethics</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);
PO9	<b>Individual and Team Work</b> Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;
PO10	<b>Communication</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;
PO11	<b>Project Management and Finance</b> Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments;
PO12	<b>Life Long Learning</b> Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

## **BACHELOR PROGRAMME COURSE SYNOPSIS**

### **First Year Courses**

**BEE1113**  
Fundamental of Electrical Engineering  
Credit: 3  
Pre-Requisite: None

#### Synopsis

This module will introduce students to basic science of electricity, introduction to instrumentation and measurement, work and energy theorem, basic AC and DC circuit and introduction to magnetism.

#### Course Outcomes

CO1 Understand the fundamental of electrical and electronic engineering and its applications  
CO2 Solve basic DC and AC circuits by using Ohms Law and its related applications

**KUK1213**  
Computer Programming for Engineers  
Credit: 3  
Pre-Requisite: None

#### Synopsis

This subject aims to introduce the fundamental element and feasibilities of the computer programming for engineers. The contents emphasis not only on the theoretical knowledge of programming but also the practical implementation in real-life situation. Students will learn basic structure of computer programming including variables and data types, input/output instruction, assignment instruction, decision instruction, repetition instruction, functions, arrays, string and reading/writing from/to text files. Students will be taught on developing a program to solve general engineering problems, mathematical equations and displaying the data via 2D and 3D graphs.

#### Course Outcomes

CO1 Apply the basic principles and concept of computer programming to solve engineering problems with utilization of mathematics & sciences knowledge.  
CO2 Construct structure programming technique and develop a computer program using high level programming language to solve engineering problems.  
CO3 Develop a solution using computer programming techniques and tools for solving engineering problems.

**BEL1233**  
Digital Electronics  
Credit: 3  
Pre-Requisite: None

#### Synopsis

This course emphasizes on the fundamental of digital electronics. The student is first taught about the number system and logic gates before introducing them to digital IC technology. Then they are exposed to both combinational logic network and combinational MSI logic. In concurrence with this, the fundamental of sequential logic, flip-flop, counter and shift register will be taught. Finally, the memory devices are introduced.

#### Course Outcomes

CO1 Explain and apply various techniques for digital logic fundamental, sequential logic system, and memory devices.  
CO2 Analyze sequential logic system in designing counter, shift register and MSI logic circuit.  
CO3 Construct and apply various techniques in designing combinational and sequential logic system.

**BEL1123**  
Circuit Analysis 1  
Credit: 3  
Pre-Requisite: BEL1113 Fundamental of Electrical Engineering

#### Synopsis

This course introduces the basic concepts and engineering methods of DC circuit analysis. The contents include Ohm's Law, Kirchhoff's Law, series and parallel circuits, Mesh and Nodal analysis, Superposition, Source Transformation, Thevenin's and Norton's theorems, Capacitor, Inductor and responses of First Order circuits.

#### Course Outcomes

- CO1 Attribute the basic concepts of electrical quantities by using basic circuit laws and simplification of resistive circuits.  
 CO2 Analyze DC circuit problems using circuit theorem, nodal analysis and mesh analysis.  
 CO3 Analyze the characteristic of natural and step response in first order circuits.  
 CO4 Construct DC electric circuits to apply the concept of electrical quantities and verify circuit theorems in simulation tools  
 CO5 Demonstrate the role of individual in the team to achieve task completion.

BEL1233  
 Analog Electronics  
 Credit: 3  
 Pre-Requisite: BEL1123 Circuit Analysis I

#### Synopsis

This course introduces the fundamental of semiconductor devices known as diode, bipolar junction transistor (BJT) and Field-Effect Transistor (FET). It also describes their operational characteristic that covers the DC and AC analysis as well as its frequency responds. In addition, some important devices such as op-amp and active filters are also introduced.

#### Course Outcomes

- CO1 Describe the characteristic, parameters and understand the operation of semiconductor diode, BJT and FET.  
 CO2 Analyze the operation of BJT and FET amplifier circuits (in DC and AC analysis) and the frequency response of the amplifiers.  
 CO3 Construct and analyze the diode

circuits, BJT and FET amplifier circuits.  
 CO4 Work effectively as an individual and in a group

BEL1113  
 Instrumentation & Measurements  
 Credit: 3  
 Pre-Requisite: None

#### Synopsis

This course introduces students to the principles of instrumentation and measurements, determination of error that caused by the meters. The students will be exposed to the architecture and the operation of DC and AC meters, oscilloscope, signal generator, sensors and transducers, analysis of DC and AC meters and introduction to signal conditioning

#### Course Outcomes

- CO1 Explain the basic concept of Instrumentation & measurement system including the operations and calculations of AC & DC meters, oscilloscope, and signal generator  
 CO2 Analyze measuring devices and signal conditioning based on amplifier, protection circuit, bridge circuit and filters  
 CO3 Construct the operation of meters, measuring devices or signal conditioning circuits into trainer board and interpret the experimental results into report

### Second Year Courses

KUK2443  
 Numerical Methods & Optimization  
 Credit: 3  
 Pre-Requisite: None

#### Synopsis

This subject teaches the techniques by which mathematical problems are formulated so that they can be solved with arithmetic operations. Topics covered in this subject are roots of equation, systems of linear algebraic equations, optimisation, curve fitting, numerical differentiation &

integration, ordinary differential equation and partial differential equation. Some software packages are introduced to empower the students in problem solving.

#### Course Outcomes

- CO1 Optimise a process employing numerical methods.
- CO2 Apply numerical methods as a problem-solving tool.
- CO3 Solve optimisation & numerical methods problem by using software packages

BEL2123

Electromagnetic Fields Theory 1

Credit: 3

Pre-Requisite: BUM2123 Applied Calculus

#### Synopsis

This course introduces students on the importance and the applications of the Electromagnetic Fields Theory in the Electrical Engineering courses. The syllabus covered includes the concepts vector fields specifically on electrostatic field.

#### Course Outcomes

- CO1 Apply knowledge of mathematics, science, and engineering fundamentals in 0-, 1-, 2- and 3- dimensional space problems of electrostatic fields.
- CO2 Identify, formulate and analyze the electrostatic fields problems.
- CO3 Conduct investigation into electrostatic problems using fundamental knowledge and research methods.

BEL2113

Circuit Analysis 2

Credit: 3

Pre-Requisite: BEL1123 Circuit Analysis 2

#### Synopsis

This course provides the basic concepts and engineering methods of AC circuits. The contents include applications of Mesh

and Nodal analysis, Superposition and Source Transformation Theorems, Thevenin and Norton Theorem. Resonant circuit, second order circuit and Balanced 3-phase circuits are also covered.

#### Course Outcomes

- CO1 Analyze AC circuit problems using nodal, mesh, Superposition, Source Transformation, Thevenin and Norton.
- CO2 Perform AC steady-state power calculations, power Triangle, power factor correction and 3-phase.
- CO3 Analyze variation of RLC circuits.
- CO4 Apply the theorems and concepts in order to analyze any given linear electric circuit.
- CO5 Work in a team and communicate effectively.

BEL2313

Principles of Communication Systems

Credit: 3

Pre-Requisite: BEL1123 Circuit Analysis 2

#### Synopsis

This course introduces theories in the area of communication systems. Topics covered include the basic elements of communications, signal analysis, amplitude modulation, angle modulations and digital modulations, as well as transmission channels and noise impact on the modulation system. Finally, some emergence of digital communication technologies are presented and compared.

#### Course Outcomes

- CO1 Analyze and differentiate analog modulation and demodulation techniques.
- CO2 Apply the knowledge of communication theory and techniques in wireless and mobile communication systems.
- CO3 Analyze different types of digital transmission and digital modulation techniques.
- CO4 Use and apply modern computational techniques and tools to measure the parameters for analog and

digital communication system.  
CO5 Shows ability to communicate effectively.

BEL2612  
Electrical Engineering Laboratory 1  
Credit: 2  
Pre-Requisite: None

#### Synopsis

TBA

#### Course Outcomes

TBA

KUK2142  
Engineering Economics  
Credit: 2  
Pre-Requisite: None

#### Synopsis

This course deals with cost analysis in engineering decision-making, the management aspects and control of complex projects. Engineering economics topics include cost estimation, time value of money, interest formulas and equivalence calculations, measures of investment worth, depreciation and income tax analysis

#### Course Outcomes

CO1 To identify, formulate and analyze the economic feasibility of a plant, carried out by examining the capital cost and the manufacturing cost obtained from the cost estimation techniques.

CO2 To apply theoretical and conceptual knowledge of financial statement, money-time relationship, depreciation and after-tax economic analysis to solve engineering economics problem.

CO3: To demonstrate understanding in economic decision-making process by applying the knowledge in the individual and teamwork tasks.

BEL2323  
Principles of Control Systems  
Credit: 3  
Pre-Requisite: None

#### Synopsis

This course introduces students to the control system technology, mathematical models of feedback systems. The students will be exposed to transient and steady-state analysis, root locus, frequency response and analysis design of compensator. Students will utilize Matlab and Simulink software for simulating PID controller and will be exposed to PID controller trainer on actual.

#### Course Outcomes

CO1 Derive and manipulate mathematical model and transfer function of physical systems.

CO2 Understanding control system performance in terms of time and frequency domains for both transient and steady-state responses of a linear time-invariant systems.

CO3 Analyze control system performance in terms of time and frequency domains for both transient and steady-state responses of a linear time-invariant systems.

CO4 Express ideas precisely, effectively and confidently, in written and oral communication.

BEL2133  
Electromagnetic Fields Theory 2  
Credit: 3  
Pre-Requisite: BEL2123 Electromagnetic Fields Theory 2

#### Synopsis

This course introduces students on the importance and the applications of the Electromagnetic Fields Theory in the Electrical Engineering courses. The syllabus covered includes the concepts of magnetostatic field and electromagnetic field (time varying field).

### Course Outcomes

CO1 Identify, formulate and analyze the magnetostatic fields and electromagnetic wave problems.

CO2 Conduct investigation into magnetostatic problems using fundamental knowledge and research methods.

#### BEL2413

Electrical Power System

Credit: 3

Pre-Requisite: BEL2113 Circuit Analysis 2

#### Synopsis

This course introduces the fundamental of electrical power system which are the overview of power system, generation, transmission lines, distribution, representation of components, basic power system analysis.

#### Course Outcomes

CO1 Compute load factor, load demand in distribution system and determine cost of electricity using the basic concept of electricity tariff and energy efficiency.

CO2 Develop the component representation of any balanced three phase power system using per-unit system and analyse the balanced fault system.

CO3 Analyse the performances of power transmission lines.

CO4 Design and investigate the circuit of distribution and transmission systems.

CO5 Analyse the importance of electrical power system for sustainable development

#### BEL2622

Electrical Engineering Laboratory 2

Credit: 2

Pre-Requisite: None

#### Synopsis

TBA

#### Course Outcomes

TBA

### Third Year Courses

#### KUK3562

Occupational Safety & Health

Credit: 2

Pre-Requisite: None

#### Synopsis

This course describes the processes of managing occupational safety and health (OSH) matters in an organization. It introduces the Malaysian OSH Acts and Regulations, OSH Standards, OSH programs that need to be carried out to minimize hazards, risks, accidents and health effects among workers at workplace in the organization.

#### Course Outcomes

CO1 Apply the principles and system requirements of Occupational Safety and Health in organisation

CO2 Evaluate Occupational Safety and Health management programs related to the hazards

CO3 Perform the investigation on industrial accident

CO4 Prepare safety management program to organisation

#### BEL3213

Signal & Systems

Credit: 3

Pre-Requisite: BUM2133 Ordinary Differential Equation, BEL2113 Circuit Analysis 2

#### Synopsis

This course introduces the students to various signals transformation techniques and its application to electrical circuits. This includes Fourier Series, Fourier Transforms and Laplace Transform. The concept of frequency response is introduced in filter.

#### Course Outcomes



CO1 Identify the different types & operations of signal, and suitable Fourier techniques.

CO2 Analyse electrical problems and passive filters using circuit laws, Fourier and/or Laplace technique.

CO3 Investigate signal and system characteristics using engineering software/knowledge.

CO4 Conduct independent readings and research in signal and system applications

BEL3111

Engineering Design Principle

Credit: 1

Pre-Requisite: BEL2622 Electrical Engineering Laboratory 2

#### Synopsis

This course introduces, educate and develop students to integrate their technical knowledge and generic skills gained in their first two years of study. It consist of knowledge and flow of a design project from sketching, design in necessary software. The translation of the idea into a professional drawing is also covered in this course. In the end of sessions, students are expected to be able to identify the complex problem to be solved, plan the solution for the problem and eventually execute the project. The course includes complex electrical and electronics engineering problems and proposal of design systems, components or processes that integrate core areas. Students will be divided into small groups of three or four members to conduct project that integrates multi-disciplinary areas. Students are required to produce product which considers environmental safety and sustainability.

#### Course Outcomes

CO1 Analyze and propose solutions for project complex engineering problem

CO2 Design systems that includes components or processes using modern tool in complex engineering problem

CO3 Develop sustainable design system

CO4 Work in a team effectively as an

individual and in a group

CO5 Apply the theory of management principles and engineering to manage project.

CO6 Demonstrate independent critical thinking, rational inquiry and self-directed learning

BEL3513

Electrical Machines

Credit: 3

Pre-Requisite: BEL2113 Circuit Analysis 2, BEL2123 Electromagnetic Field Theory 1

#### Synopsis

This course introduces the fundamental concepts and principles of transformer and various types of electrical machines. It is intended for students to understand fundamental aspects of rotating electrical machines. The first part of the course is a quick review of some electromagnetism fundamental while the following will deal with the transformers and different types of electrical machines

#### Course Outcomes

CO1 Acquire fundamental principles of electromagnetism, transformer and electrical machines

CO2 Analyze the transformer and machines equivalent circuits and the operating conditions for electrical machines under steady state conditions

CO3 Ability to provide a design level of solution to technical problem on transformers or electrical machines

BEL3612

Electrical Engineering Laboratory 3

Credit: 2

Pre-Requisite: None

#### Synopsis

TBA

#### Course Outcomes

TBA

KUK3022  
Engineers in Society  
Credit: 2  
Pre-Requisite: None

#### Synopsis

This course introduces the engineering profession, engineers and research, ethics and public responsibility, engineer and law, and contract law.

#### Course Outcomes

- CO1 Describe the understanding of engineering profession, accreditations and professional bodies.
- CO2 Explain the ethics, public responsibility and the laws in engineering practise.
- CO3 Display effective leadership and teamworking ability in completing the report and presentation.

BEL3413  
Electrical Installation Design  
Credit: 3  
Pre-Requisite: BEL2622 Electrical Engineering Laboratory 2

#### Synopsis

This course provides knowledge in electrical installation design especially for commercial buildings. It explores the basic estimation and design procedure based on various codes of practice and standards. Student will be introduced to design a few basic systems in electrical installation such as lighting, protection system, grounding and lightning protection. Students also involve in problem solving and troubleshooting technique when they study on system inspection and testing.

#### Course Outcomes

- CO1 Design lighting layout and power layout and draw using Autocad software.
- CO2 Estimate electrical load for an installation and design single-line diagram

- for the installation.
- CO3 Explain the protection system used in electrical installation.
- CO4 Design grounding system and lightning protection system.
- CO5 Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

BEL3423  
Power System Analysis  
Credit: 3  
Pre-Requisite: BEL2413 Electrical Power System

#### Synopsis

This course introduces students to the fundamental concepts of power system analysis which covered the power flow problem analysis, balance and unbalance faults analysis. Students will be exposed to the problems commonly encountered in power system engineering practice, analysis and techniques applied to solve some practical problems in power systems.

#### Course Outcomes

- CO1 Apply knowledge of electrical power system fundamentals to the solution of complex electrical power system network
- CO2 Develop power flow solutions considering, if any, fault conditions for power system network
- CO3 Develop power system study (PSS) under steady state conditions using power system software
- CO4 Relate the works of engineer with the ethics and professionalism

BEL3523  
Power Electronics  
Credit: 3  
Pre-Requisite: BEL1233 Analog Electronics

#### Synopsis

The primary objective of this course is to

give students a foundation of knowledge, understanding, analysis and design of power electronics circuits for energy conversion. This course presents concepts, fundamental analysis tools, and a range of power electronics applications. Intermediate level simulation activities will also be conducted.

#### Course Outcomes

CO1 Investigate switching characteristics of basic solid-state power devices, operating principles, advantages and disadvantages of basic power  
 CO2 Analyse the power electronics topology with CCM and DCM operation.  
 CO3 Analysis power electronics circuit using simulation environment.

BEL3622  
 Electrical Engineering Laboratory 4  
 Credit: 2  
 Pre-Requisite: None

#### Synopsis

TBA

#### Course Outcomes

TBA

BEL3724  
 Integrated Design Project  
 Credit: 4  
 Pre-Requisite: BEL3111 Engineering Design Principle

#### Synopsis

This course introduces, educate and develop students to integrate their technical knowledge and generic skills gained in their first two years of study. It consist of knowledge and flow of a design project from sketching, design in necessary software. The translation of the idea into a professional drawing is also covered in this course. In the end of sessions, students are expected to be able to identify the complex problem to be

solved, plan the solution for the problem and eventually execute the project. The course includes complex electrical and electronics engineering problems and proposal of design systems, components or processes that integrate core areas. Students will be divided into small groups of three or four members to conduct project that integrates multi-disciplinary areas. Students are required to produce product which considers environmental safety and sustainability.

#### Course Outcomes

CO1 Design systems that includes various components or processes from different core areas  
 CO2 Utilize modern engineering tools or software in designing/developing the solution  
 CO3 Relate environmental issues for sustainability development  
 CO4 Work in a team effectively as an individual and in a group  
 CO5 Apply the theory of management principles and engineering to manage project  
 CO6 Demonstrate independent critical thought, rational inquiry and self-directed learning

BEL3715  
 Industrial Training  
 Credit: 5  
 Pre-Requisite: Minimum 70 Credits

#### Synopsis

This course introduces students to industrial training, expose them to professional skills and experience in the aspect of electrical engineering field. The exposure will help to produce an excellent, responsible with good ethical for their personal development.

#### Course Outcomes

CO1 Response and comply with the importance of society, environment and sustainability in engineering practices, decisions, and solutions.

CO2 Practice the professionalism and work etiquette that comply to be a good and responsible engineer.

CO3 Communicate effectively on complex engineering activities such as being able to comprehend and write effective reports and design documentation and make effective presentations

CO4 Practice and contribute taught theories to solve real time problem through involvement in various scopes of works such as planning concept, design, construction & project administration

### **Fourth Year Courses**

KUK4412  
Project Management  
Credit: 2  
Pre-Requisite: None

#### Synopsis

This subject introduces the concept of project management which will provide the students with the knowledge of managing projects. As an introduction, students will be given general information on project life cycle and management. Then they will be given exposure to different techniques of project scheduling, monitoring and resource management.

#### Course Outcomes

CO1 Describe the elements phases involve in project lifecycle

CO2 Differentiate types of project organization and explain the role of stakeholders in the project management

CO3 Plan a project work program and apply techniques for resource management

CO4 Apply and develop project planning and scheduling tasks into appropriate planning software.

BEL4413  
Electrical Power Generation and High Voltage Engineering  
Credit: 3

Pre-Requisite: BEL2413 Electrical Power System

#### Synopsis

This course introduces students to the concept of power system protection and high voltage engineering. It covers in detail the components of power system protections and relay coordination. The theory of high voltage engineering will also be covered in this course.

#### Course Outcomes

CO1 Explain power system protection and electrical breakdown concept in high voltage engineering.

CO2 Perform calculation in power system protection and high voltage generation.

CO3 Design power system protection system and high voltage related system.

CO4 Relate the works of an engineer with ethics and professionalism.

BEL4423  
Power System Operation & Control  
Credit: 3  
Pre-Requisite: BEL2413 Electrical Power System

#### Synopsis

This course presents the concept of power system operation and control. Students will be exposed to the concept of power system management to meet load demand at optimal operating cost and various ways in controlling electrical power.

#### Course Outcomes

CO1 Perform calculation and analyze related to Economic Dispatch (ED) of power system operation.

CO2 Perform calculation and analyze related to Active Power and Frequency Control.

CO3 Perform calculation and analyze related to Reactive Power and Voltage Control.

CO4 Relate the works of engineer with

the ethics and professionalism.

BEL4513  
Electronic Drives & Applications  
Credit: 3  
Pre-Requisite: None

#### Synopsis

This course is designed to give students a foundation of knowledge of electrical drives systems and its control mechanism. The course is divided into the DC and the AC drives system to enhance students understanding of the practical aspects of the drives systems to relate them to theoretical aspects. This course also conducted practical experiments in the laboratory to give students some practical experience.

#### Course Outcomes

CO1 Explain the theoretical concepts of dynamics of electric drives.  
CO2 Apply the appropriate control methods for an electric drives.  
CO3 Analyze the performance of DC motor drives and AC induction motor drives in applications.

BEL4433  
Power Quality  
Credit: 3  
Pre-Requisite: BEL2113 Circuit Analysis 2

#### Synopsis

This course is an introduction to power quality disturbances. It first introduces the concept of power quality and then quantifies the particular power quality disturbances that fall within the wider umbrella of electromagnetic phenomena. It provides a strong foundation for better understanding of the underlying principles of each power quality problem. Students are exposed to power quality solutions, standards, monitoring tools, grounding practices and distributed generation.

#### Course Outcomes

CO1 Explain the characteristic, causes & effects along with mitigation of power quality issues; sag, swell, transient, harmonics, interruptions, voltage variations & power factor  
CO2 Investigate a given power quality case/incident by utilising appropriate techniques and tools; including severity analysis and mitigation suggestion.  
CO3 Relate the work of engineer with the ethics & professionalism.

BEL4443  
Renewable Energy System  
Credit: 3  
Pre-Requisite: None

#### Synopsis

This course gives students the fundamental concept of renewable alternative energy. It covers energy conversion, utilization and storage system for renewable technologies such as solar, wind, biomass, fuel cell, wave and etc. However, this course emphasis on the design and installation of photovoltaic (PV) system. It also touches upon the environmental consequences of energy conversion and how alternative energy can reduce pollution and global climate change.

#### Course Outcomes

CO1 Analyze performance of renewable energy system and its components under certain condition.  
CO2 Construct renewable energy system based upon common standards and practices .  
CO3 Explain the current and future trends of renewable energy scenario, resources, issues and technologies.

BEL4523  
Power System Protection  
Credit: 3  
Pre-Requisite: BEL2123 Electromagnetic Field Theory 1

#### Synopsis

TBA

Course Outcomes

TBA

BEL4223

Embedded Controller Technology

Credit: 3

Pre-Requisite: BEL1223 Digital Electronics

Synopsis

This course is designed to give the students a solid foundation in bare-metal firmware development for ARM-based microcontroller. The goal of this course is to teach students how to navigate the microcontroller reference manual and datasheet to extract the right information to professionally build peripheral devices and firmware. To achieve this goal, no libraries are used, purely bare-metal embedded-c and register manipulations. By the end of this course, students will be able to configure microcontroller peripherals like GPIO, UART, ADC and Timer.

Course Outcomes

CO1 Understanding and Illustrate the Cortex-M Architecture (C2)

CO2 Design and develop a firmware using bare-Metal Embedded C programming (C3)

BEL4213

Rapid Digital System Prototyping

Credit: 3

Pre-Requisite: None

Synopsis

In this course, digital design is taught at a higher level of abstraction than BEL1223. It provides an in-depth coverage of systematical development and synthesis of digital system with emphasis on Hardware Description Language (HDL). It covers with the proper planning techniques, design strategy and tools, functional verification and system implementation. The

information gained can be applied to any digital design by using a top-down synthesis design approach. Through this course, student will be able to create digital design faster, shorten development time and lower the development costs.

Course Outcomes

CO1 Apply knowledge of digital electronic to realize the combinational and sequential logic systems using different technologies.

CO2 Analyze problems in digital systems to propose design solutions based on the combinational and sequential logic principles.

CO3 Investigate logic circuits and Hardware Description Language (HDL) modules to fulfill design requirements.

BEL4313

Microwave Engineering

Credits: 3

Pre-Requisite: BEL2133 Electromagnetic Field Theory 2

Synopsis

This course emphasizes on the theory and principles of microwave engineering in communication system. The theory of microwave engineering involves network analysis, microwave system principles such as filters, amplifiers, mixers, and oscillator. In this course the student also will be exposed to the parameters of antenna such as radiation pattern, impedance matching techniques, practical antenna design, antenna measurement technique and introduction to wireless communication systems.

Course Outcomes

CO1 Analyze microwave network using transmission line theory, waveguide and impedance matching for microwave principles.

CO2 Investigate the principle of microwave components such as filters, amplifiers, mixers, oscillators and antennas.

BEL4453  
Forensic Engineering  
Credit: 3  
Pre-Requisite: None

Synopsis

TBA

Course Outcomes

TBA

BEL4712  
Undergraduate Research Project 1  
Credit: 2  
Pre-Requisite: Minimum 70 Credits  
(including BEL3111 Engineering Design  
Principle)

Synopsis

This course introduces and exposes students to acquire and apply knowledge of sciences and electrical & electronics engineering fundamentals through individual project assessment. The students will learn how to identify, formulate and provide effective solution to engineering problem.

Course Outcomes

- CO1 Propose an engineering solution using appropriate methods and apply appropriate techniques and tools
- CO2 Discuss the outcomes of the project through analysis of preliminary results and interpretation of data, and provide valid conclusions.
- CO3 Demonstrate clarity, coherence and cohesion in writing and oral presentation.
- CO4 Demonstrate independence in exploration of resources and decision-making towards completion of the project

BEL4724  
Undergraduate Research Project 2  
Credit: 4  
Pre-Requisite: BEL4712 Undergraduate  
Research Project 1

Synopsis

This course introduces students to acquire and apply knowledge of sciences and electrical & electronics engineering fundamentals through individual project assessment. The students will learn to design and evaluate the performance of a system using integrated and interdisciplinary approaches.

Course Outcomes

- CO1 Explain the significance of the proposed project and produce a coherent literature review
- CO2 Develop an engineering solution using appropriate methods and design a system that meet specified requirements
- CO3 Discuss the outcomes of the project through analysis of results and interpretation of data, and provide valid conclusions
- CO4 Apply appropriate tools and demonstrate ability to handle electrical and electronic devices and softwares
- CO5 Explain the impact of the engineering solution to society, environment, and sustainability
- CO6 Demonstrate professionalism, general ethics and moral principle towards completion of the project
- CO7 Demonstrate clarity, coherence and cohesion in writing and oral presentation
- CO8 Demonstrate independence in exploration of resources and decision-making towards completion of the project

## CURRICULUM STRUCTURE BACHELOR OF INDUSTRIAL ENGINEERING WITH HONOURS

YEAR SEMESTER	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
	BF11101 Intro to Industrial Engineering	BF11203 Materials Science	BMM12313 Computer Aided Design	BKF1333 Thermodynamics	BMM13323 Mechanical Design	BMM13613 Mechanical Vibrations	BF14713 Facilities Planning	BF14813 Production Planning & Control
	BMM1213 Statics	BMM1223 Dynamics	BMM1233 Strength of Materials	BMM13753 Manufacturing Processes	BMM13413 Automatic Control	BF13613 Ergonomics & Work Design	BF14723 Operation Research	BF14823 Industrial Simulation
	BEL1113 Fundamental of Electrical Engineering	BF11221 Engineering Lab 1	BAA2713 Fluid Mechanics	BMM13423 Measurement & Instrumentation	BF13543 Quality Engineering	KUK13022 Engineers In Society	BF14702 Undergraduate Research Project 1	BF14804 Undergraduate Research Project 2
	KUK1213 Computer Programming for Engineers	BUM12133 Ordinary Differential Equation	KUK2443 Numerical Methods & Optimisation	BF12421 Engineering Lab 2	BF13531 Engineering Lab 3	BF13632 Engineering Lab 4	KUK4412 Project Management	BF14**3 Industrial Engineering Elective 2
COURSES	BUM12123 Applied Calculus	UHL2422 English for Technical Communication	BUM2413 Applied Statistics	KUK2142 Engineering Economics	BF13551 Integrated Design Project 1	BF13623 Integrated Design Project 2	BF14**3 Industrial Engineering Elective 1	B*****3 Free Elective 2
	UHL2400 Fundamentals of English	UHC1012 Falsafah dan Isu Semasa	UHL2432 English For Professional Communication	BF12411 Six-Sigma Module 1	BF13511 Six-Sigma Module 2	BF13611 Six-Sigma Module 3	B*****3 Free Elective 1	
	UHL2412 English for Academic Communication	UQ*2**1 Co-Curriculum 2		UHF10*1 Foreign Language Level 1	KUK3562 Occupational Safety & Health	UGE2002 Technopreneurship		
	UQB1**1 Co-Curriculum 1	UHS1022 Soft Skills		UHC2022 PENGHAYATAN ETIKA DAN PERADABAN	UHF2**1 Foreign Language Level 2			
TOTAL CREDIT	16	17	17	16	17	16	5	16
TOTAL CREDIT FOR GRADUATION	136							



### ELECTIVE COURSES FOR BACHELOR OF INDUSTRIAL ENGINEERING WITH HONOURS

NO.	CODE	COURSE	CREDIT HOUR
1	BFI4743	Advanced Quality Engineering	3
2	BFI4753	Lean Production System	3
3	BFI4773	Value Engineering	3
4	BFI4783	Advanced Operation Research	3
5	BFI4793	Ergonomics For Design	3
6	BFI4833	Sustainable Manufacturing System	3
7	BFI4843	Predictive Maintenance	3
8	BFI4853	Intelligent Engineering Optimization	3
9	BFI4863	Smart Manufacturing	3
10	BFI4873	AI For Industrial Engineers	3
<b>Total Minimum Credits Of Elective Courses For Graduation</b>			<b>12</b>

PEO	PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	PERFORMANCE INDICATOR
PEO1	Graduates are competent, practice professionalism and accomplish advanced standing in related engineering fields.	60% of graduates serving in engineering and technical profession. 5% of graduates promoted to higher positions in their organizations.
PEO2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% of graduates pursuing advanced degree or professional certifications.
PEO3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	70% of graduates registered with professional bodies 5% of graduates participating in local community network.

<b>PROGRAMME OUTCOMES (PO)</b>	
<p>Programme Outcomes describe what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviour that students acquire through the programme. Students of an engineering programme are expected to attain the following POs:</p>	
PO1	<p><b>Engineering Knowledge</b> Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems;</p>
PO2	<p><b>Problem Analysis</b> Identify, formulate, conduct research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (WK1 to WK4);</p>
PO3	<p><b>Design/Development of Solutions</b> Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (WK5);</p>
PO4	<p><b>Investigation</b> Conduct investigation of complex engineering problems using research-based knowledge (WK8) and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid</p>

	conclusions;
PO5	<b>Modern Tool Usage</b> Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK6);
PO6	<b>The Engineer and Society</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems (WK7);
PO7	<b>Environment and Sustainability</b> Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts. (WK7);
PO8	<b>Ethics</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);
PO9	<b>Individual and Team Work</b> Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;
PO10	<b>Communication</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;
PO11	<b>Project Management and Finance</b> Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments;
PO12	<b>Life Long Learning</b> Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

## BACHELOR OF INDUSTRIAL ENGINEERING WITH HONOURS

BFI1101

Introduction to Industrial Engineering

Credit: 1

Pre-Requisite: None

### Synopsis

This course introduced the student to industrial engineering fields. It also provides an understanding for students the skills and requirements necessary toward obtaining a degree in engineering. The students also will be exposed with basic knowledge in industrial engineering as a preparation for registering fundamental industrial engineering courses.

### Course Outcomes

- Explain the meaning, role and requirement of engineering as a discipline and profession.
- Demonstrate the fundamental knowledge of industrial engineering.

BMM1213

Statics

Credit Hour: 3

Prerequisite: None

### Synopsis

An introduction to solving engineering static problem, involving: force vector, equilibrium of particle and rigid body, friction effect on rigid body equilibrium, structural analysis, frame and machines, centroids, center of gravity and moment of inertia.

### Course Outcome

- Analyze equilibrium of particle and rigid body.
- Analyze equilibrium of rigid body involve friction and structural analysis
- Evaluate centroids and moment of Inertia, of composite cross-sectional area.
- Demonstrate the solution of the problems.

BFI1203

Materials Science

Credit Hour: 3

Prerequisite: None

### Synopsis

This course is an introduction to materials science and engineering. Students are expected to have understanding on crystal structure, mechanical and physical properties of materials, phase diagram, phase transformation and the strengthening mechanism for metal alloys also application and processing of metals, ceramics, polymers and composites.

### Course Outcome

- Analyse the materials structure, application, mechanical and physical properties of materials.
- Analyse the phase diagram, transformation and the strengthening mechanism for metal alloys.
- Evaluate various types of engineering materials, their structure-properties and processing method.
- Analyse the characteristics of each engineering materials towards environmental and sustainability

BMM1553

Dynamics

Credit Hour: 3

Prerequisite: BMM1213 Statics

### Synopsis

This course introduces kinematics (motion of rigid body) inclusive of absolute and relative motion (displacement, velocity and acceleration) and dynamics (forces, work, energy, inertia and momentum).

### Course Outcome

- Analyse dynamics problems involving kinematics (motion of rigid body) inclusive of absolute and relative motion (displacement, velocity and acceleration).
- Analyse dynamics problems involving kinetics of rigid bodies inclusive forces based from Newton's Second Law.
- Analyse kinetics of rigid body involving work, energy and momentum problem using Working Model 2D.

BFI1221

**Engineering Laboratory 1**

Credit Hour: 1

Prerequisite: None

**Synopsis**

This course introduces students with safe working habits, identify common materials used in metal fabrication, reading blueprints, identification, care & use basic measuring instruments, layout methods and basic hand tools. Emphasis is placed on operation of metrology, benchwork, lathe and milling project.

**Course Outcome**

- Describes the lathe and milling machine, tools and procedures.
- Demonstrates the appropriate techniques for basic measuring instrument, lathe and milling machine.
- Practice laboratory activities while preserving environment and sustainability.

**BMM1233**

Strength of Materials

Credit Hour: 3

Prerequisite: BMM1213 Statics

**Synopsis**

This course introduces the concept of stress, stress and strain under axial loading, torsion, pure bending, analysis and design of beams for bending, shearing stresses in beam and thin-walled members.

**Course Outcome**

- Analyze stress/strain problems in structural members under axial loadings.
- Analyze the circular member problems which are subjected to torques.
- Analyze the stresses and strains problems in members subjected to pure bending and transverse loading.
- Analyze and design of beams for bending.

**BMM3753**

Manufacturing Processes

Credit Hour: 3

Prerequisite: None

**Synopsis**

This course introduces students to manufacturing processes used for converting raw materials into finished products. Various processes, machinery, and operations will be examined with emphasis placed on understanding engineering materials and processing parameters that influence design considerations, product quality, and production costs. Sustainable manufacturing process will be discussed in student project presentation.

**Course Outcome**

- Evaluate different types of metal & polymer solidification processes.
- Interpret forming processes for bulk metal, sheet metal and powder metallurgy.
- Justify major types of material removal process, joining process and surface treatments.
- Justify a process flow to manufacture a conceptual product by considering sustainable manufacturing process.

**BFI2421**

Engineering Laboratory 2

Credit Hour: 1

Prerequisite: Statics, Materials Science

**Synopsis**

This lab course introduces the engineering materials, statics principles, properties of material and kinetic and kinematics of particles and rigid bodies through a series of experiments. The covered topics for engineering materials experiments comprise metallurgy, Vickers hardness, and impact test. The statics experiments covered are friction and equilibrium of force-moments. Experiment on strength of materials includes tensile, compression, fatigue and torsion. Lastly, the dynamics experiments covered are moment of inertia and projectile.

**Course Outcome**

- Apply the knowledge related to statics equilibrium, kinetic and kinematics principal, microstructure of materials, mechanical behaviour and properties of material.

- Analyze the problem involving statics equilibrium, kinetic and kinematics principal, microstructure of materials, mechanical behaviour and properties of material under different mechanical loads.
- Investigate the purpose and solution of a given experimental task within team members.

### BMM3323

Mechanical Design

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course is an introduction to analysis of static and fatigue failure and design of machine elements/mechanical components. Students are exposed to design of machine elements/mechanical components including shafts, keys, springs, bolts and nuts, screws, welding, bearings, belts and chains, clutches and brakes.

#### Course Outcome

- Evaluate the components to prevent failure due to static and dynamic service loads, and assess the suitable helical compression springs using table of parameters.
- Evaluate the shafts for fatigue failure, and bolts, nuts and screws for static failure, as well as welding parameters in torsion and bending.
- Evaluate bearings and flexible elements including brakes, clutches, belts and pulleys, and assess gears based on given parameters to predict wear and bending.
- Show the ability to explore and expand various new information and complete required work related to welding cases in torsion and bending and assessment of gears for wear and bending

### BMM3413

Automatic Control

Credit Hour: 3

Prerequisite: BMM 1553 Dynamics

#### Synopsis

This course introduces linear, time-invariant

(LTI) control system modelling, analysis and design. The covered topics are frequency domain modelling of mechanical, electrical and electro-mechanical systems; time response analysis, frequency response analysis, stability analysis and steady-state analysis. Control system design and analysis using PID controller technique.

#### Course Outcome

- Evaluate the basic control system concepts and illustrate the required control system into block design process.
- Develop frequency domain transfer function of linear, time invariant (LTI) control systems for mechanical system
- Synthesize the transient response, steady-state response and system stability of LTI control system compensators to achieve specified control system performances which is related to the real world problems by utilizing root-locus technique and PID.

### BMM3423

Measurement & Instrumentation

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the principles of measurement, signal analysis and provides the students hands-on laboratory experience with a variety (or selected) transducers and instruments (including 'virtual instruments'). Students also expose on how to write professional technical reports.

#### Course Outcome

- Explain in details the basic element in measurement and instrumentation system.
- Justify the appropriate/suitable basic of signal analysis in measuring analogue signal from transducers.
- Design the instrumentation system to acquire data from transducer and analyse the data in time and frequency domain.
- Integrate between physical demonstration and oral presentation to deliver project outcome.

**BFI3531**

Engineering Laboratory 3

Credit Hour: 1

Prerequisite: Manufacturing Processes

**Synopsis**

This lab provides hands-on experience for students to learn about manufacturing processes with emphasized on safety requirements, knowledge on engineering material application and processing tools/machines. At the end of this course, student activities during lab activities will be evaluated based on their technical report.

**Course Outcome**

- Execute different manufacturing processes with standard operation procedure
- Analyse the processes and, correlate the process parameters with the manufactured parts
- Analyse sustainability of the processes

**BFI3543**

Quality Engineering

Credit Hour: 3

Prerequisite: None

**Synopsis**

This course introduces students to fundamentals of quality management and statistical quality improvement concepts. A practical state-of-the-art approach is stressed to ensure sufficient theory is presented to develop robust understandings on quality principles to monitor, control, improve product and processes.

**Course Outcome**

- Describe and apply the fundamentals of quality, total quality management, six sigma and basic quality tools.
- Summarize the findings from statistical approaches in quality control and process monitoring
- Investigate the quality of products or services using acceptance sampling and reliability test

**BFI3551**

Integrated Design Project 1

Credit Hour: 1

Prerequisite: Mechanical Design

**Synopsis**

This course provides an integrated design experience for students to apply knowledge and experiences obtained from undergraduate courses into a problem-solving situation. Students in group are required to design, develop, implement and/or improve systems that include human, material, information and resources using appropriate analytical, computational and/or experimental practices. In this part, student needs to define the problem, conduct data collection and identify potential solutions for the problem.

**Course Outcome**

- Analyze and propose solution for complex engineering problem
- Identify current issues in engineering industries

**BFI3623**

Integrated Design Project 2

Credit Hour: 3

Prerequisite: IDP 1

**Synopsis**

This course is continuation of BFI3551 Integrated Design Project 1. In this part students are expected to design, develop and analyse solutions for the studied problem using analytical, computational and/or experimental tools. Besides that, students are also expected to consider interdisciplinary parameters such as human factors, engineering economics, safety, environmental, and societal aspects in their solution.

**Course Outcome**

- Analyze and propose solution for complex engineering problem
- Develop suitable solution to the complex engineering problem
- Design systems that includes components or processes using modern tool in

- complex engineering problem
- Develop sustainable design system
- Work in a team effectively as an individual and in a group
- Instill critical thinking, independent, rational inquiry and self-directed learning
- Apply the theory of management principles and engineering to manage project
- Identify current issues in engineering industries

BFI3562

Occupational Safety & Health

Credit Hour: 2

Prerequisite:

Synopsis

This course describes the processes of managing occupational safety and health (OSH) matters in an organization. It introduces the Malaysian OSH Acts and Regulations, OSH Standards, OSH programs that need to be carried out to minimize hazards, risks, accidents and health effects among workers at workplace in the organization.

Course Outcome

- Apply the principles and system requirements of Occupational Safety and Health in organisation
- Evaluate Occupational Safety and Health management programs related to the hazards
- Perform the investigation on industrial accident
- Prepare safety management program to organization

BMM3613

Mechanical Vibrations

Credit Hour: 3

Prerequisite: Dynamics

Synopsis

This course introduces fundamental of vibration, un-damped vibration single degree of freedom (SDOF), damped vibration single degree of freedom (SDOF), two degree of

freedom (2DOF) multi degree of freedom (MDOF) and some applications of vibrations in engineering.

Course Outcome

- Evaluate and explain the solutions to vibration problems of single degree of freedom systems based on basic dynamics characteristics.
- Evaluate and explain the solutions to vibration problems that contain free and forced-vibration analysis of two and multi degree of freedom systems.
- Design the vibration measurement by considering appropriate techniques, tools and methods.
- Relate the vibration principles with actual vibration system.

BFI3613

Ergonomics & Work Design

Credit Hour: 3

Prerequisite: Dynamics

Synopsis

This subject teaches the importance of ergonomics and work design as part of methods engineering. This subject is important to teach how to increase productivity, and also to improve worker health and safety. The subject covers topics on methods engineering, work standards and good work design as these are the keys to success in both manufacturing and service industries. Some software packages are introduced to empower the students in problem solving.

Course Outcome

- Analyze methods, standards, and work design.
- Analyze and calculate the level of risk in a job causing stress, fatigue and musculoskeletal disorders and design appropriate work systems.
- Analyze the workplace and systems safety in an organization.

BFI4713

Facilities Planning

Credit Hour: 3

Prerequisite:

### Synopsis

This course introduces the facilities planning starting from introduction to facilities planning, facilities design, facilities flow systems, personnel requirements, material handling system, facilities layout planning models and design algorithm; facilities design for various applications; facilities planning systems; quantitative facilities planning models and facilities planning evaluations.

### Course Outcome

- Describe fundamental of facilities planning principles
- Analyse the flow systems, personnel requirements and material handling in facilities planning
- Design and evaluate the facilities planning system layout for a given problems

BFI4723

Operation Research

Credit Hour: 3

Prerequisite:

### Synopsis

This course introduces the operational research starting from problem formulation, solution approaches and application to IE related problems. It will cover the linear programming, Simplex method, Duality analysis and integer programming. Apart from that, a few common OR related problem in industry will be discussed such as transportation, assignment and shortest path problems.

### Course Outcome

- Develop mathematical model of real-world problem and solve using linear programming and its dual
- Analyse the best solution for transportation and assignment problems
- Formulate and identify the optimum solution for the network flow problems

BFI4702

Undergraduate Research Project 1

Credit Hour: 2

Prerequisite:

### Synopsis

This course is designed to expose students to research project. Students ought to apply the knowledge they have learned in the program to complete the research project. Every student will be supervised by an academic in doing literature survey and preparing part undergraduate thesis which contains objective of the project, problem statement, literature survey, methodology, preliminary results and references. At the end of this subject, the students are required to present their findings to their supervisor and faculty's panel.

BFI4804

Undergraduate Research Project 2

Credit Hour: 4

Prerequisite:

### Synopsis

This course is designed to expose students to research project. Students ought to apply the knowledge they have learned in the program to complete the research project. Every student will be supervised by an academic in doing literature survey and preparing part undergraduate thesis which contains objective of the project, problem statement, literature survey, methodology, preliminary results and references. At the end of this subject, the students are required to present their findings to their supervisor and faculty's panel.

BFI4813

Production Planning & Control

Credit Hour: 3

Prerequisite:

### Synopsis

This course introduces the elements of Production Planning and Control. It comprises of project management, forecasting methods, aggregate planning, scheduling, material requirement planning and lean manufacturing. At the end of semester, the student will have a knowledge on the coordination of resources and facilities to meet the optimum cost in the organization.



### Course Outcome

- Evaluate the project management with CPM, PERT and cost-time-trade off
- Evaluate the forecasting demand by using quantitative and qualitative methods.
- Evaluate the aggregate planning by using level, chase, mixed and transportation methods
- Recommend the best methods of Lean manufacturing and material requirement planning to be implemented in a selected case study.

BFI4823

Industrial Simulation

Credit Hour: 3

Prerequisite:

### Synopsis

This course introduces basics of simulation and modelling with applications to manufacturing and service systems where decision making can be enhanced through the modelling and analysis of complex system. It focuses on the construction of simulation models of real or conceptual systems using the manual, spreadsheet and the simulation software.

### Course Outcome

- Develop the understanding of the basic concept of simulation modelling
- Create and manipulate the simulation models and outputs using a specific software, statistical tools and methods in industrial and manufacturing application
- Demonstrate the knowledge of simulation techniques in solving the problem by designing an industrial system

### Electives

BFI4743

Advanced Quality Engineering

Credit Hour: 3

Prerequisite:

### Synopsis

This course introduces the concept of process variability and its relevance to modern quality engineering, experimental design, Taguchi Quality Engineering, Analysis of nested design and design for process improvement, Quality Function Deployment (QFD) and Failure Mode Effect Analysis.

### Course Outcome

- Apply Design of Experiment to identify quality problem, define and measure key process steps and inputs, and identify potential root causes of the problem
- Analyze experimental data using Taguchi and Response Surface Method for optimum quality
- Investigate possible failures in industries using Failure Mode Effect Analysis
- Construct end-user needs and transform into a detailed engineering specification using Quality Function Deployment

BFI4753

Lean Production System

Credit Hour: 3

Prerequisite:

### Synopsis

This course describes the knowledge of lean production system. It comprises of lean principles, lean tools and techniques, lean performance measurement and the success factors of lean implementation. At the end of the semester, students are required to apply the knowledge of lean production system into a selected case study.

### Course Outcome

- Apply the principles and system requirements of Lean Production System
- Apply Lean Production System Tools and Techniques in the context of manufacturing environment
- Examine the effectiveness of lean production system measurement performance.
- Evaluate a real case study by using lean production techniques.

**BFI4773**

Value Engineering

Credit Hour: 3

Prerequisite:

**Synopsis**

The course concentrates on fundamentals to provide a firm foundation for use of Value Engineering in a wide variety of applications. A lecture and laboratory format offers ample opportunity for students to apply the techniques and scientific disciplines on actual problems. The course will cover fundamentals of cost analysis, function analysis, creative problem solving, data evaluation, and reporting for decisive action. This explores the impact of technology on economics.

**Course Outcome**

- Discuss the concept of value engineering, identify the advantages and applications
- Assess value engineering concept using function analysis, group dynamics, and value engineering tools
- Apply FAST diagram, and Value Engineering (VE) study phases
- Evaluate unnecessary costs and increase function of product using VE complementary concepts

**BFI4783**

Advanced Operation Research

Credit Hour: 3

Prerequisite:

**Synopsis**

This course will cover techniques for the solution and analysis of deterministic linear models and non Linear Models used in Operations Research. It uses the Queueing Models, Dynamic programming and integer programming to analyze the structure of various complex systems occurring in industrial applications It will also discuss more complex models, such as those incorporating nonlinear constraints or uncertainty and Markov processes to solve. The main emphasis will be on solution techniques and on analysis of the underlying mathematical structure of these models

**Course Outcome**

- Develop mathematical model of real-world problem solve using linear programming and non-linear models
- Analyse the best solution for deterministic/non deterministic queueing and dynamic modelling technique
- Investigate and identify the optimum solution for Markov processes
- Use of application software/Modern tools in solving OR based problem

**BFI4793**

Ergonomics for Design

Credit Hour: 3

Prerequisite:

**Synopsis**

The subject introduces students to ergonomics in design. It is emphasizes on human-machine interaction, workplace design and human factors applications. The knowledge will be useful for the students wishing to incorporate the methods and ergonomics techniques presented here in product design, jobs, and systems in various applications. It is also will contribute to ensuring high-quality standards of human-machine interaction applications.

**Course Outcome**

- Understand the human-machine interaction in the workplace
- Understand and apply the human capabilities and limitations in design
- Analyze the human errors and human factors applications
- 

**BFI4833**

Sustainable Manufacturing System

Credit Hour: 3

Prerequisite:

**Synopsis**

This course is designed to introduce the concept of sustainable manufacturing and their applications in the industry. The course will also look at the connections of sustainable design, environmental sciences, and the social sciences with sustainable

manufacturing

#### Course Outcome

- Understand the three pillars of sustainability and how they are manifested in sustainable manufacturing
- Proposed a decision making by incorporating economic, environmental, and social aspects into decision making processes using
- Relate/Integrate manufacturing process models and sustainable manufacturing metrics for product and process improvement
- Identify sustainability issues in manufacturing system and how they are linked with manufacturing process

BFI4843

Predictive Maintenance

Credit Hour: 3

Prerequisite:

#### Synopsis

This course introduces sensors, measurement and instrumentation, vibration and signal processing, vibration faulty and isolation, maintenance principle and predictive maintenance.

#### Course Outcome

- Develop sensors and instrumentation model of real-machine problem using instrumentation simulation
- Analyse the vibration problems solution using signal processing technique for predicting faulty
- Investigate the maintenance problems and solve using vibration principle
- Propose solution in predictive maintenance using modern tools

BFI4853

Intelligent Engineering Optimization

Credit Hour: 3

Prerequisite:

#### Synopsis

This course introduced optimization techniques using a modern approach. It will

cover common optimization metaheuristic algorithms such as Genetic Algorithm, Ant Colony Optimization and Particle Swarm. In addition, this course also discusses multi-objective optimization using traditional and domination concepts. Finally, these optimization techniques will be applied for engineering design and industrial engineering problems.

#### Course Outcome

- Generalize the concept of metaheuristics from different optimization algorithms
- Distinguish multi-objective optimization approaches for different type of problems
- Formulate and optimize engineering problem using intelligent optimization techniques

BFI4863

Smart Manufacturing

Credit Hour: 3

Prerequisite:

#### Synopsis

This course introduces manufacturing process and evaluation, sensors, measurement and instrumentation, artificial intelligence, manufacturing optimization, tool condition monitoring, smart manufacturing.

#### Course Outcome

- Develop manufacturing process parameters and evaluation relationship using DOE analysis
- Analyse and optimize the manufacturing process using artificial intelligence
- Investigate and develop the tool condition monitoring of manufacturing process
- Propose solution in smart manufacturing using modern tools

BFI4873

AI for Industrial Engineers

Credit Hour: 3

Prerequisite:

#### Synopsis

This course exposed students to artificial intelligence, in line with Fourth Industrial

Revolution (IR 4.0). It will discuss the fundamentals of AI, machine learning and search algorithms. In this course, the AI is specifically implemented for industrial engineering applications including forecasting, production planning, scheduling and facilities design.

#### Course Outcome

- Explain the wide variety of machine learning algorithm
- Analyse the output prediction performance of the neural network
- Recommend optimal solution for decision making using search algorithm

## CURRICULUM STRUCTURE BACHELOR OF MECHANICAL ENGINEERING (AUTOMOTIVE) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
COURSES	UHL2400 Fund. of English Language	UHL2422 English for Technical Comm.	BMM2513 Thermodynamics	UHL2432 English for Professional Comm.	BMM3533 Heat Transfer	BMA3213 Vehicle Dynamics	BMA4812 Undergraduate Research Project 1	UHC2022 Penghayatan Etika dan Peradaban
	UHL2412 English for Academic Comm.	UHC1012 Falsafah dan Isu Semasa	BMM2253 Fluids Mechanics	BUM2413 Applied Statistics	BMM3413 Automatic Control	BMM3423 Measurement & Instrumentation	BMA4812 Undergraduate Research Project 1	BMA4824 Undergraduate Research Project 2
	UQB1**1 Co. Curriculum 1	UHF1**1 Foreign Language Level 1	BMA2313 Automotive CAD	UHE3**2 Elective Social Science	BMA3323 Automotive Design	BMA3613 Vehicle Vibrations	BMA4343 Integrated Design Project 2	KUK4412 Project Management
	BUM 2123 Applied Calculus	BUM 2133 Ordinary Differential Equations	BMM2272 ME Engineering Lab 2	UHF2**1 Foreign Language Level 2	BMM3282 ME Engineering Lab 3	BMA3723 Automotive Product Development	BMM4771 Advance Six Sigma	*****3 Technical Elective 2
	BMM1711 Introduction to Engineering	UHS1022 Soft Skills	BMA2713 Automotive Electric & Electronics	BMA2523 Internal Combustion Engine	BMM3731 Introductory Six Sigma	BMA3331 Integrated Design Project 1	*****3 Technical Elective 1	*****3 Free Elective 2
	BMM1213 Statics	UQB2**1 Co. Curriculum 2	KUK2443 Numerical Methods & Optimization	BMA2323 Vehicle Design & Styling	BMM3753 Manufacturing Processes	BMM3741 Intermediate Six Sigma	*****3 Free Elective 1	
	BMM1133 Materials Science	BMM1223 Dynamics		KUK2142 Engineering Economics	KUK3022 Engineer in Society	BMA3762 ME Engineering Lab Auto		
	BMM1722 ME Engineering Lab 1	BMM1233 Strength of Materials				KUK3562 Occupational Safety & Health		
	KUK1213 Computer Programming for Engineers					BMM3995 Industrial Training		
TOTAL CREDIT	18	17	17	16	17	23	14	14
TOTAL CREDIT FOR GRADUATION	136							

**ELECTIVE COURSES FOR  
BACHELOR OF MECHANICAL ENGINEERING (AUTOMOTIVE) WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BMA4513	Energy Efficient Vehicle	3
2	BMA4713	Motorsports Engineering	3
<b>Total Minimum Credit of Elective Subjects for Graduation</b>			<b>12</b>

PEO	PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	PERFORMANCE INDICATOR
PEO1	Graduates are competent, practice professionalism and accomplish advanced standing in related engineering fields.	60% of graduates serving in engineering and technical profession. 5% of graduates promoted to higher positions in their organizations.
PEO2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% of graduates pursuing advanced degree or professional certifications.
PEO3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	70% of graduates registered with professional bodies 5% of graduates participating in local community network.

<b>PROGRAMME OUTCOMES (PO)</b>	
Programme Outcomes describe what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviour that students acquire through the programme. Students of an engineering programme are expected to attain the following POs:	
PO1	<b>Engineering Knowledge</b> Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems;
PO2	<b>Problem Analysis</b> Identify, formulate, conduct research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (WK1 to WK4);
PO3	<b>Design/Development of Solutions</b> Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (WK5);
PO4	<b>Investigation</b> Conduct investigation of complex engineering problems using research-based knowledge (WK8) and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;
PO5	<b>Modern Tool Usage</b> Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK6);
PO6	<b>The Engineer and Society</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to

	professional engineering practice and solutions to complex engineering problems (WK7);
PO7	<b>Environment and Sustainability</b> Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts. (WK7);
PO8	<b>Ethics</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);
PO9	<b>Individual and Team Work</b> Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;
PO10	<b>Communication</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;
PO11	<b>Project Management and Finance</b> Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments;
PO12	<b>Life Long Learning</b> Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

## **BACHELOR OF MECHANICAL ENGINEERING (AUTOMOTIVE) WITH HONOURS**

BMM 1711

Introduction to Engineering

Credit Hour:1

Prerequisite: None

### Synopsis

This course is intended to expose fresh engineering students with the understanding of the importance of engineering in shaping the world's progress and development since early civilisation until the current era, and how as engineers of the future they need to continue the legacy to be innovative and creative to continuously make the world a better place for people. Students shall be introduced to the various engineering disciplines as well as links and interactions between courses that they shall undergo to prepare them to be competent as engineers. They shall also be introduced with the necessary skills, discipline and traits that they need to develop to enable them to pursue their future career with strong values along with high discipline and integrity.

### Course Outcome

- 01: Describe the understandings of engineering development from the past until today.
- 02: Describe the understandings of engineering, its domains and the principals of being an engineer
- 03: Describe the understanding of engineering ethics, engineering society and it's important in engineering profession
- 04: Demonstrates the importance of effective engineering communications & creative thinking

BMM1213

Statics

Credit Hour: 3

Prerequisite: None

### Synopsis

This course introduces the engineering static problem that involves force vector, equilibrium of

particle and rigid body, friction effect on rigid body equilibrium, structural analysis, frame and machines, centroids, centre of gravity and moment of inertia.

### Course Outcome

- 01: Analyse equilibrium of particle and rigid body.
- 02: Evaluate equilibrium of rigid body involve friction and structural analysis.
- 03: Evaluate centroids and moment of Inertia, of composite cross-sectional area.
- 04: Demonstrate solution of the problem.

BMM1133

Materials Science

Credit Hour: 3

Prerequisite: None

### Synopsis

This course is an introduction to materials science and engineering. Students are expected to have understanding on crystal structure, mechanical and physical properties of materials, phase diagram, phase transformation and the strengthening mechanism for metal alloys also application and processing of metals, ceramics, polymers and composites.

### Course Outcome

By the end of semester, students should be able to:

- 01: Analyze the materials structure, application, mechanical and physical properties of materials.
- 02: Analyze the phase diagram, phase transformation and the strengthening mechanism for metal alloys.
- 03: Evaluate various types of engineering materials (metals, ceramics, polymers and composites), their structure-



properties relationship and processing method.

04: Analyze the characteristics of each engineering materials towards environmental and sustainability

**BMM1722**

ME Engineering Lab 1

Credit Hour: 2

Prerequisite: None

### Synopsis

This course introduces students with safe working habits, identify common materials used in metal fabrication, reading blueprints, identification, care & use basic measuring instruments, layout methods and essential hand tools. Emphasis is placed on the operation of metrology, benchwork, and lathe project.

### Course Outcome

By the end of semester, students should be able to:

01: Ability to describe the lathe machine, tooling's, and technical procedures.

02: Ability to demonstrate the appropriate techniques for the basic measuring instrument.

03: Ability to practice general safety for the mechanical laboratory activities.

04: Ability to interpret the mechanical laboratory works in a presentation.

**KUK1213**

Computer Programming for Engineers

Credit Hour: 3

Prerequisite: None

### Synopsis

This subject aims to introduce the fundamental element and feasibilities of the computer programming for engineers. The contents emphasis not only on the theoretical knowledge of programming but also the practical implementation in real-life situation. Students will learn basic structure

of computer programming including variables and data types, input/output instruction, assignment instruction, decision instruction, repetition instruction, functions, arrays, string and reading/writing from/to text files. Students will be taught on developing a program to solve general engineering problems, mathematical equations and displaying the data via 2D and 3D graphs.

### Course Outcome

01: Apply the basic principles and concept of computer programming to solve engineering problems with utilization of mathematics & sciences knowledge.

02: Construct structure programming technique and develop a computer program using high level programming language to solve engineering problems.

03: Develop a solution using computer programming techniques and tools for solving engineering problems.

**BMM1223**

Dynamics

Credit Hour: 3

Prerequisite: BMM1213

### Synopsis

This course introduces kinematics (motion of rigid body) including of absolute motion(displacement, velocity and acceleration) and dynamics (forces, work, energy, inertia and momentum).

### Course Outcome

01: Understand the principle of kinematics of rigid body, kinetics of rigid body involving forces, work, energy, impulse and momentum.

02: Analyze the dynamics problem involving the kinematics of rigid body, kinetics of rigid body involving forces, work, energy, impulse and momentum.

03: Design a dynamic system based on principle of kinematics and kinetic of rigid body.

04: Investigate the kinematics and kinetics phenomena of a rigid body motion

### BMM1233

Strength of Materials

Credit Hour: 3

Prerequisite: BMM1213

#### Synopsis

This course introduces the concept of stress, stress and strain under axial loading, torsion, pure bending, analysis and design of beams for bending, shearing stresses in beam and thin-walled members.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Analyze stress/strain problems in structural members under axial loadings
- 02: Analyze the circular member problems which are subjected to torques
- 03: Analyze stress/strain problems in members under pure bending and transverse loading
- 04: Analyze and design of beams for bending

### BMM2513

Thermodynamics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course is designed to introduce basic concept in thermodynamic in a thorough way. Topics cover are properties of pure substances, thermodynamics system, the first law of thermodynamics for closed systems, open systems and their application in steady-flow and unsteady-flow processes, the second law of thermodynamics, entropy, introduction to refrigeration and steam power plant.

#### Course Outcome

By the end of semester, students should be able to:

- 01: To discover the state of properties

from property diagram and obtaining data from property table.

02: To solve mass and energy balance of a process for both closed and open system by using the first law of thermodynamics.

03: To analyze the efficiency of a system (e.g., heat engine, heat pump, refrigerator) and its technical feasibility using the second law of thermodynamics and entropy concept.

### BMM2253

Fluid Mechanics

Credit Hour: 3

Prerequisite: None

#### Synopsis

To introduce the fundamental principles of fluid mechanics, the basic equations governing fluid statics and fluid kinematic, and the methods of solving engineering problems related to fluid mechanics. The covered topics are fluid properties, fluid static and dynamics, Bernoulli's equation and applications, momentum equation and its application, analysis of flow in pipeline system and dimensional analysis.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Recognize and describe the fundamentals of fluid mechanics
- 02: Apply the concept of fluid mechanics to overcome engineering problems
- 03: Analyze and find solutions to problems related to fluid mechanics

### BMA2313

Automotive CAD

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces basic graphical communication, basic manual technical

drawing, fundamentals of CAD software development, fundamentals of drawing by using design software, 2D and 3D related drawing commands for a better understanding for mechanical engineering purpose.

#### Course Outcome

By the end of semester, students should be able to:

01: Analyze the fundamentals of 2D engineering drawing features and specification by using manual technical drawing method.

02: Evaluate the fundamentals of CAD software development.

03: Analyze the fundamentals of 3D engineering drawing features and specification by using CAD software.

#### BMM2272

ME Engineering Lab 2

Credit Hour: 2

Prerequisite: BMM1213, BMM1133 & BMM1223

#### Synopsis

This lab introduces engineering materials, statics, kinetics and kinematics through practical experiments. The covered topics for engineering materials experiments comprise steel microstructure microscopy, hardness test and heat treatment of metals while forces and precision friction measurement on an inclined plane are corresponding to the topics for statics experiments. The demonstration of mechanics, kinetics and kinematics concepts are experimentally investigated from tensile and compression test, bending and shearing, free fall and inertial in rotational motion.

#### Course Outcome

By the end of semester, students should be able to:

01: Investigation of mechanical properties of materials such as hardness,

friction coefficient and microstructure of materials after heat treatment.

02: Identify the common properties of material under tension, compression, bending moment, shearing force, free fall and kinematic of rigid body on incline plane through ethical engineering practice.

03: Organize and communicate the results of experimental work through well written report and effective presentation for dissemination of technical information.

#### BMA2713

Automotive Electric & Electronics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course covers the fundamentals in the area of automotive electricity and electronics and familiarizes students with both analytical and computational tools in analyzing vehicle electrical and electronics components and systems. The content includes Ohm's Law, Kirchhoff's Law, series-parallel circuit analyses, electronics components, batteries, electromagnetism principles and key automotive sensors, actuators and control systems principles.

#### Course Outcome

By the end of semester, students should be able to:

01: To analyze the problems of electricity and electronics in automotive.

02: To apply electrical and electronics principles in automotive components and systems.

#### KUK2443

Numerical Methods & Optimization

Credit Hour: 3

Prerequisite: None

#### Synopsis

This subject teaches the techniques by which mathematical problems are formulated so that they can be solved with arithmetic operations. Topics covered in

this subject are roots of equation, systems of linear algebraic equations, optimisation, curve fitting, numerical differentiation & integration, ordinary differential equation and partial differential equation. Some software packages are introduced to empower the students in problem solving.

#### Course Outcome

- 01: Optimise a process employing numerical methods.
- 02: Apply numerical methods as a problem-solving tool.
- 03: Solve optimisation & numerical methods problem by using software packages.

#### BMA2523

Internal Combustion Engine

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course provides the engineering foundations for understanding the engine design and operation parameters, thermo chemistry, combustion, heat transfer, ideal models of engine cycle, pollutant formation and control, and engine auxiliary systems.

#### Course Outcome

- 01: Evaluate the engine type, performance and effect of design parametric changes on engine performance.
- 02: Evaluate the engine combustion and heat transfer processes using fundamental of thermochemistry and actual combustion processes.
- 03: Analyze the thermodynamic cycles of internal combustion engine.
- 04: Evaluate the effect of operational parametric changes on overall engine performance and exhaust pollutant emissions.

#### BMA2323

Vehicle Design & Styling

Credit Hour: 3

Prerequisite: BMA2313

#### Synopsis

This course introduces fundamental techniques of vehicle styling, and the components associated such as sketching, rendering, surfacing, as well as model making. During the course students are exposed to techniques in automobile styling design through basic conceptual sketches, finished rendering, 2D and 3D graphics and clay model. This course also exposes students to automotive product planning, automotive packaging, engineering design, homologation, and automotive manufacturing and assembly.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Create basic automotive sketches and rendering.
- 02: Express the requirements of automotive product planning, automotive packaging, engineering design, homologation, and automotive manufacturing and assembly.
- 03: Create an automotive styling project from understanding requirements to concept, sketching, rendering and model making.
- 04: Integrate automotive engineering, design and styling aspects via final critique session.

#### KUK2142

Engineering Economics

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course deals with cost analysis in engineering decision-making, the management aspects and control of complex projects. Engineering economics topics include cost estimation, time value of money, interest formulas and equivalence calculations, measures of investment worth, depreciation and income tax

analysis.

#### Course Outcome

01: To identify, formulate and analyze the economic feasibility of a plant, carried out by examining the capital cost and the manufacturing cost obtained from the cost estimation techniques.

02: To apply theoretical and conceptual knowledge of financial statement, money-time relationship, depreciation and after-tax economic analysis to solve engineering economics problem.

03: To demonstrate understanding in economic decision-making process by applying the knowledge in the individual and teamwork tasks.

#### BMM3533

Heat transfer

Credit Hour: 3

Prerequisite: BMM2513 & BMM2253

#### Synopsis

The basic modes of thermal energy transfer viz., conduction, convection and radiation are introduced with emphasis on understanding the fundamental concepts to be used in analyzing and solving real-life problems. The applicability of 1-D heat conduction in various geometries, the validity of one dimensional heat conduction in fins, the distinction between steady and unsteady states, the concept of boundary layer, the analogy between fluid flow and convective heat transfer, the distinction between free and forced convection, the properties of materials which are responsible for energy transfer by radiation, the principles in the design of heat exchangers with emphasized on fundamental concepts and design methods.

#### Course Outcome

By the end of semester, students should be able to:

01: Analyze the concept of conduction, convection and radiation heat transfer

through appropriate mathematical equation.

02: Formulate and evaluate one-dimensional heat transfer for different geometries.

03: Formulate and evaluate one-dimensional heat transfer for different geometries.

04: Summarize the problem in simple radiation heat transfer.

05: Investigate the design of heat exchanger for application in industries.

#### BMM3413

Automatic control

Credit Hour: 3

Prerequisite: BMM1223

#### Synopsis

This course introduces linear, time-invariant (LTI) control system modelling, design, and analysis. Topics covered are basic control system properties, frequency domain modelling of mechanical system, time response analysis, frequency response analysis, stability analysis, steady-state analysis, control system design using root locus, compensator and PID controller.

#### Course Outcome

By the end of semester, students should be able to:

01: Evaluate a control system model and properties.

02: Analyze a control system time response and frequency response.

03: Design a suitable controller for a control system using root locus, compensator and PID controller.

04: Investigate the stability of a control system using Routh-Hurwitz criteria and root locus.

#### BMA3323

Automotive Design

Credit Hour: 3

Prerequisite: BMM1233

### Synopsis

This course extends the knowledge on mechanics of material towards automotive designs through component design. The design of essential machine elements is demonstrated. The internal combustion engine kinematics and dynamics are analyzed. The design of internal combustion engine components is examined. Computer-aided engineering tools are utilized in analyzing internal combustion engine components. Balancing analysis is done finally.

### Course Outcome

By the end of semester, students should be able to:

- 01: Evaluate the kinematics and dynamics of an engine.
- 02: Design Internal Combustion Engine Components.
- 03: manipulate CAE tools for ICE components design and analysis.
- 04: Engine Design Balancing.

### BMM3282

ME Engineering Lab 3

Credit Hour: 2

Prerequisite: BMM2253 & BMM2513

### Synopsis

This lab introduces students to the fundamental concepts and practical applications of thermo-fluids and heat transfer experimentation, from the virtual instrumentation and data acquisition requirements to subsequent data analysis techniques. It covers the areas of flow patterns over different immersed bodies, fluid flow determination and validation of Bernoulli's theorem, pumps and systems, turbines, friction losses in pipes, properties of pure substances, first and second laws of thermodynamics, ideal and perfect gas characteristics, refrigeration cycles, heat conduction, heat convection, as well as heat radiation.

### Course Outcome

By the end of semester, students should be able to:

- 01: Implement fluid dynamics, thermodynamics, and heat transfer knowledge to investigate the thermofluidic behavior via suitable experimental setup.
- 02: Demonstrate professional ethics and responsibilities to complete the laboratory tasks.
- 03: Interpret the findings from experiment with thermo-fluids fundamental and appropriate data analyses by writing effective report.

### BMM3731

Introductory Six Sigma

Credit Hour: 1

Prerequisite: None

### Synopsis

This course describes partially the methodologies of six sigma by defining and measuring the problem which faced by the organization. It is comprising various tools and techniques for defining and measuring the real problem. At the end of this course the student will be able to identify and prioritize the main problem for improvement.

### Course Outcome

By the end of semester, students should be able to:

- 01: To apply six sigma tools and techniques in defining the actual problem.
- 02: To measure the selected problem through performance measurement.
- 03: To organize the seriousness of identified problem based on basic statistical tools.

### BMM3753

Manufacturing process

Credit Hour: 3

Prerequisite: None

### Synopsis

This course introduces students to the fundamental of manufacturing processes which are used to convert raw materials into finished products. Various processes, machinery, and operations will be discussed with emphasis on understanding the fundamental of engineering materials and processing parameters that influence design considerations, product quality, and production costs. This course also will introduce students to sustainable manufacturing which one of the important aspects of modern manufacturing.

#### Course Outcome

- 01: Evaluate different types of metal & polymer solidification processes.
- 02: Interpret forming processes for bulk metal, sheet metal and powder metallurgy.
- 03: Justify major types of material removal process, joining process and sustainable manufacturing.
- 04: Formulate a process flow to manufacture a conceptual product by considering sustainable manufacturing process.

#### KUK3022

Engineering in Society

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course introduces the engineering profession, engineers and research, ethics and public responsibility, engineer and law, and contract law.

#### Course Outcome

- 01: Describe the understanding of engineering profession, accreditations and professional bodies.
- 02: Explain the ethics, public responsibility and the laws in engineering practise.
- 03: Display effective leadership and teamworking ability in completing the report and presentation.

#### BMA3213

Vehicle Dynamics

Credit Hour: 3

Prerequisite: BMM1223

#### Synopsis

In this course, we will analyse the fundamental of dynamic for unrestricted ground vehicle with independent motion by considering the tire mechanics, nonlinear and linear dynamics equation of motion. Then, we will determine the effect of steering characteristic and steering system on the vehicle dynamic performance which includes the steady state cornering. by understanding the fundamental aspect, we can assess the active safety control system for conventional vehicle and discover the development system for future modern vehicle.

#### Course Outcome

- 01: Evaluate the kinematics and kinetics for unrestricted ground vehicle with independent motion by considering the tire mechanics, nonlinear and linear dynamics equation of motion.
- 02: Determine the effect of steering characteristic and steering system on the vehicle dynamic performance which includes the steady state cornering.
- 03: Assess the active safety control system for conventional vehicle and discover the development system for future modern vehicle.
- 04: Examine vehicle dynamics during critical driving and road condition using simulation model and determine the appropriate solution as counter measures.

#### BMM3423

Measurements & Instrumentation

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the principles of measurement, signal analysis and provides

the students hands-on laboratory experience with a variety (or selected) transducers and instruments (including 'virtual instruments'). Students also expose on how to write professional technical reports.

#### Course Outcome

01: Explain in details the basic element in measurement and instrumentation system; and fundamental of selected important transducers.

02: Justify the appropriate/suitable basic of signal analysis in measuring analogue signal from transducers.

03: Design virtual instrumentation system to acquire data from transducer and analyse the data in time and frequency domain.

04: Integrate between physical demonstration and oral presentation to deliver project outcome.

#### BMA3613

Vehicle Vibrations

Credit Hour: 3

Prerequisite: BMM1223

#### Synopsis

This subject introduces the principles of vibrations, analysis methods, and their applications, along with the frequency and time responses of vibrating systems; ride comfort which based on the natural frequencies and mode shapes of the vehicle. SDOF of vibration isolator and vehicle suspension, optimized vibration suspension and quarter car model will also be discussed.

#### Course Outcome

By the end of semester, students should be able to:

01: Assess the frequency and time response of vibration.

02: Discuss the equations of motion, natural frequencies and mode shape of different model of vehicles

03: Propose the good suspension

system based on optimal damper and spring design chart

04: Evaluate the frequency response of quarter car model

#### BMA3723

Automotive Product Development

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the concept of automotive product development process. It covers the research and development process, stages of tooling process, production line process as well as the quality system used in automotive production line.

#### Course Outcome

By the end of semester, students should be able to:

01: Describe the research and development process of automotive product and its organization.

02: Compare the tooling process in products development based on parts function.

03: Identify the effect of manufacturing process on the quality of the production parts.

04: Design and analyse the automotive product from the start of benchmarking to production.

#### BMA3331

Integrated Design Project 1

Credit Hour: 1

Prerequisite: BMA3323

#### Synopsis

This course prepares a detailed comprehensive design project focusing on design and development the product. The students will learn about project management, communication, documentation, working in teams and



design methodology. Students has to include the application of the design process to solve the complex engineering problem. The projects challenge students to apply the knowledge and skills they learned throughout their degree to real-world problems. Each team produces detailed drawings, a presentation and concept design report at the end of the semester.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Develop suitable solution to the complex engineering problem.
- 02: Work in a team effectively as an individual and in a group.
- 03: Identify current issues in engineering industries.

#### BMM3741

Intermediate Six Sigma

Credit Hour: 1

Prerequisite: BMM3731

#### Synopsis

This course describes partially methodologies of six sigma in analyzing and improving the problem which faced by the organization. Its comprising various tools and techniques for analyzing and improving. At the end of this course the student will be able to perform analysis on the discovered problem and able to identify the potential improvement.

#### Course Outcome

By the end of semester, students should be able to:

- 01: To brainstorm on potential root causes to the identified problem.
- 02: To analyze a problem by using statistical analysis tools.
- 03: To identify the list of improvement for discovered problem

#### BMA3762

ME Engineering Lab Auto

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course introduces basic understanding through experiments of basic automotive system applied in common vehicle. The experiments cover internal combustion engine, automotive braking system, gearing system, Radiator cooling system and steering system.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Dress safely for the laboratory, behave safely in the laboratory, recognize the importance of keeping the laboratory clean and tidy, and demonstrate on awareness of the laboratory safety rules written in the safety contract.
- 02: To implement automotive engineering knowledge for the investigation of behavior in automotive systems through suitable experimental setup.
- 03: To demonstrate detailed experimental methods and present experiments result to prove working principles of systems in automotive.

#### KUK3562

Occupational Safety & Health

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course describes the processes of managing occupational safety and health (OSH) matters in an organization. It introduces the Malaysian OSH Acts and Regulations, OSH Standards, OSH programs that need to be carried out to minimize hazards, risks, accidents and health effects among workers at workplace in the organization.

#### Course Outcome

01: Apply the principles and system requirements of Occupational Safety and Health in organization.

02: Evaluate Occupational Safety and Health management programs related to the hazards.

03: Perform the investigation on industrial accident.

04: Prepare safety management program to organization.

#### BMM3995

Industrial Training

Credit Hour: 5

Prerequisite: None

#### Synopsis

This course introduces students to industrial training, expose them to professional skills and experience in the aspect of mechanical engineering field. The exposure will help to produce an excellent, responsible with good ethical for their personal development.

#### Course Outcome

By the end of semester, students should be able to:

01: Response and comply with the importance of society, environment and sustainability in engineering practices, decisions, and solutions.

02: Practice the professionalism and work etiquette that comply to be a good and responsible engineer.

03: Communicate effectively on complex engineering activities such as being able to comprehend and write effective reports and design documentation and make effective presentations.

04: Practice and contribute taught theories to solve real time problem through involvement in various scopes of works such as planning concept, design, construction & project administration.

#### BMA4812

Undergraduate Research Project 1

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course is designed to expose students to research project. Students ought to apply the knowledge they have learned in the program to complete the research project. Every student will be supervised by an academic in doing literature survey and preparing part undergraduate thesis which contains objective of the project, problem statement, literature survey, methodology, preliminary results and references. At the end of this subject, the students are required to present their findings to their supervisor and faculty's panel.

#### Course Outcome

By the end of semester, students should be able to:

01: To identify and analyze research problems using the principles of mathematics, natural sciences or engineering science.

02: To design and develop solutions based on research problems.

03: To communicate effectively on research outcomes with the engineering community and society (oral and written).

04: To engage in independent and life-long learning in the broader context of technological change, enhance individual's soft skill and organization skills in research activities.

#### BMA4343

Integrated Design Project 2

Credit Hour: 3

Prerequisite: BMM3331

#### Synopsis

This course is a continuation of BMA3331 Integrated Design Project 1 where it is totally on the execution/fabrication and related analyses of the system/machine. Students work in small teams under the close supervision of faculty members.

Each team produces comprehensive specifications, a presentation, and a prototype of the proposed design. They also write reports and prepare presentations describing their work. All reports are expected to meet professional standards.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Analyze and propose solutions for project complex engineering problem.
- 02: Develop suitable solution to the complex engineering problem.
- 03: Design systems that includes components or processes using modern tool in complex engineering problem.
- 04: Develop sustainable design system.
- 05: Work in a team effectively as an individual and in a group.
- 06: Instill critical thinking, independent, rational inquiry and self-directed learning.
- 07: Apply the theory of management principles and engineering to manage project.
- 08: Identify current issues in engineering industries.

#### BMM4771

Advance Six Sigma

Credit Hour: 1

Prerequisite: BMM3741

#### Synopsis

This course describes the knowledge of implementing six sigma in the organisation. The student will apply six sigma knowledges into the provided case study. This subject comprises of improve and control/verify phase which including various tools and techniques for improvement. At the end of this course, the student will be able to apply and recommend the guideline for six sigma implementations from a beginning until the final solution.

#### Course Outcome

- 01: To apply various tools and techniques for quality improvement.
- 02: To determine the control activities for betterment in operation or services.
- 03: To organise the priority of challenges and barriers in implementing six sigma

#### BMA4824

Undergraduate Research Project 2

Credit Hour: 4

Prerequisite: BMA4812

#### Synopsis

This course is designed to expose students to research project. Students ought to apply the knowledge they have learned in the program to complete the research project. Every student will be supervised by an academic in doing literature survey and preparing part undergraduate thesis which contains objective of the project, problem statement, literature survey, methodology, preliminary results and references. At the end of this subject, the students are required to present their findings to their supervisor and faculty's panel.

#### Course Outcome

By the end of semester, students should be able to:

- 01: To identify and analyze research problems using the principles of mathematics, natural sciences or engineering science.
- 02: To design and develop solutions based on research problems.
- 03: To conduct investigation on research problems including design of experiments, analysis and data interpretation, and conclusion.
- 04: To practice the use of modern tools in science and engineering
- 05: To communicate effectively on research outcomes with the engineering community and society (oral and written).

06: To engage in independent and life-long learning in the broader context of technological change, enhance individual's soft skill and organization skills in research activities.

KUK4412  
Project Management  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This subject introduces the concept of project management which will provide the students with the knowledge of managing projects. As an introduction, students will be given general information on project life cycle and management. Then they will be given exposure to different techniques of project scheduling, monitoring and resource management.

#### Course Outcome

- 01: Describe the elements phases involve in project lifecycle.
- 02: Differentiate types of project organization and explain the role of stakeholders in the project management.
- 03: Plan a project work program and apply techniques for resource management.
- 04: Apply and develop project planning and scheduling tasks into appropriate planning software.

#### BMA Elective Courses

BMA4513  
Energy Efficient Vehicle  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

EEV is a new concept of automotive engineering where fuel consumption, alternative energy vehicle and efficient design is encompassed. There are multiple approaches, where the efficient structure of the vehicle body is evaluated for efficiency.

The fundamental of vehicle forces acting and how to reduce inefficiency is discussed. Green technology and hybrid body structure is also included. The body is subjected to analysis of flow for its efficiency.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Evaluate the construction of the automotive vehicle.
- 02: Analysis of body designs and optimizations of parameters.
- 03: Computational discretization of the body design.
- 04: Design of new vehicle body for hybrid, green technology vehicle

BMA4713  
Motorsports Engineering  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course focuses on the introduction to motorsports engineering, types of racing engines, advanced vehicle materials and structure, and manufacturing technique extant in this field. It also covers the modification as enhancement in motorsport system feature, racing theories and strategies, regulation and safety in motorsports engineering.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Appraise the fundamental of motorsports engineering in the basis of racing theories, strategies, regulations, and safety. (C)
- 02: Evaluate the advancement of motorsport in the aspect of advanced materials and structure usage and modification techniques as well as manufacturing techniques utilize in the production of components and parts for motorsports. (C)

03: Perform the developed responds effectively to unexpected experiences, modify instruction to meet the requirements in performing the technique teaches (P).

04: Carry out and display good teamwork spirit and discipline in group activities (A).

## CURRICULUM STRUCTURE BACHELOR OF MECHANICAL ENGINEERING WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
COURSES	UHL2400 Fund. of English Language	UHL2422 English for Technical Comm.	BMM2513 Thermodynamics	UHL2432 English for Professional Comm.	BMM3533 Heat Transfer	UHF2**1 Foreign Language Level 2	UGE2002 Technopreneurship	UHC2022 Penghayatan Etika dan Peradaban
	UHL2412 English for Academic Comm.	UHC1012 Falsafah dan Isu Semasa	BMM2243 Advanced Strength of Materials	BUM2413 Applied Statistics	BMM3413 Automatic Control	BMM3423 Measurement & Instrumentation	BMM4812 Undergraduate Research Project 1	BMM4824 Undergraduate Research Project 2
	UQB1**1 Co. Curriculum 1	UHF1**1 Foreign Language Level 1	BMM2253 Fluids Mechanics	UHE3**2 Elective Social Science	BMM3323 Mechanical Design	BMM3613 Mechanical Vibrations	BMM4343 Integrated Design Project 2	KUK4412 Project Management
	BUM2123 Applied Calculus	BUM2133 Ordinary Differential Equations	BMM2313 Computer Aided Design	BMM2523 Advanced thermodynamics	BMM3282 ME Engineering Lab 3	BMM3293 FEM	BMM4771 Advance Six Sigma	*****3 Technical Elective 2
	BMM1711 Introduction to Engineering	UHS1022 Soft Skills	BMM2272 ME Engineering Lab 2	BMM2263 Advanced Fluids Mechanics	BMM3731 Introductory Six Sigma	BMM3331 Integrated Design Project 1	*****3 Technical Elective 1	*****3 Free Elective 2
	BMM1213 Statics	UQB2**1 Co. Curriculum 2	KUK2443 Numerical Methods & Optimization	BMM2713 Fundamental of Electrical Engineering	BMM3753 Manufacturing Processes	BMM3741 Intermediate Six Sigma	*****3 Free Elective 1	
	BMM1133 Materials Science	BMM1223 Dynamics		KUK2142 Engineering Economics	KUK3022 Engineer In Society	BMM3762 ME Engineering Lab 4		
	BMM1722 ME Engineering Lab 1	BMM1233 Strength of Materials				KUK3562 Occupational Safety & Health		
	KUK1213 Computer Programming for Engineers					BMM3995 Industrial Training		
	<b>TOTAL CREDIT</b>	<b>18</b>	<b>17</b>	<b>17</b>	<b>18</b>	<b>17</b>	<b>21</b>	<b>14</b>
<b>TOTAL CREDIT FOR GRADUATION</b>	<b>136</b>							

**ELECTIVE COURSES FOR  
BACHELOR OF MECHANICAL ENGINEERING WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BMM4213	Biomechanics & Biomedical Engineering	3
2	BMM4413	Hydraulics & Pneumatics	3
3	BMM4313	Mechanism Design	3
4	BMM4513	Power Plant Technology	3
5	BMM4223	Computational Fluid Dynamics	3
6	BMM4233	Corrosion Science & Engineering	3
7	BMM4723	Ergonomics	3
8	BMM4733	Production Planning Control	3
9	BMM4743	Quality Engineering	3
10	BMM4253	Continuum Solid Mechanics	3
11	BMM4713	Metal Casting	3
12	BMM4113	Advanced Materials Characterisation Theories & Tools	3
<b>Total Minimum Credit of Elective Subjects for Graduation</b>			<b>12</b>

PEO	PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	PERFORMANCE INDICATOR
PEO1	Graduates are competent, practice professionalism and accomplish advanced standing in related engineering fields.	60% of graduates serving in engineering and technical profession. 5% of graduates promoted to higher positions in their organizations.
PEO2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% of graduates pursuing advanced degree or professional certifications.
PEO3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	70% of graduates registered with professional bodies 5% of graduates participating in local community network.

<b>PROGRAMME OUTCOMES (PO)</b>	
<p>Programme Outcomes describe what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviour that students acquire through the programme. Students of an engineering programme are expected to attain the following POs:</p>	
PO1	<p><b>Engineering Knowledge</b> Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems;</p>
PO2	<p><b>Problem Analysis</b> Identify, formulate, conduct research literature and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences (WK1 to WK4);</p>
PO3	<p><b>Design/Development of Solutions</b> Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (WK5);</p>
PO4	<p><b>Investigation</b> Conduct investigation of complex engineering problems using research-based knowledge (WK8) and research methods, including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions;</p>
PO5	<p><b>Modern Tool Usage</b> Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations (WK6);</p>
PO6	<p><b>The Engineer and Society</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems (WK7);</p>
PO7	<p><b>Environment and Sustainability</b> Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts. (WK7);</p>
PO8	<p><b>Ethics</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);</p>
PO9	<p><b>Individual and Team Work</b> Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;</p>
PO10	<p><b>Communication</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions;</p>
PO11	<p><b>Project Management and Finance</b> Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments;</p>
PO12	<p><b>Life Long Learning</b> Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change</p>



## BACHELOR OF MECHANICAL ENGINEERING WITH HONOURS

BMM 1711

Introduction to Engineering

Credit Hour: 1

Prerequisite: None

### Synopsis

This course is intended to expose fresh engineering students with the understanding of the importance of engineering in shaping the world's progress and development since early civilisation until the current era, and how as engineers of the future they need to continue the legacy to be innovative and creative to continuously make the world a better place for people. Students shall be introduced to the various engineering disciplines as well as links and interactions between courses that they shall undergo to prepare them to be competent as engineers. They shall also be introduced with the necessary skills, discipline and traits that they need to develop to enable them to pursue their future career with strong values along with high discipline and integrity.

### Course Outcome

01: Describe the understandings of engineering development from the past until today.

02: Describe the understandings of engineering, its domains and the principals of being an engineer

03: Describe the understanding of engineering ethics, engineering society and it's important in engineering profession

04: Demonstrates the importance of effective engineering communications & creative thinking

BMM1213

Statics

Credit Hour: 3

Prerequisite: None

### Synopsis

This course introduces the engineering static problem that involves force vector, equilibrium of particle and rigid body, friction effect on rigid

body equilibrium, structural analysis, frame and machines, centroids, centre of gravity and moment of inertia.

### Course Outcome

01: Analyse equilibrium of particle and rigid body.

02: Evaluate equilibrium of rigid body involve friction and structural analysis.

03: Evaluate centroids and moment of Inertia, of composite cross-sectional area.

04: Demonstrate solution of the problem.

BMM1133

Materials Science

Credit Hour: 3

Prerequisite: None

### Synopsis

This course is an introduction to materials science and engineering. Students are expected to have understanding on crystal structure, mechanical and physical properties of materials, phase diagram, phase transformation and the strengthening mechanism for metal alloys also application and processing of metals, ceramics, polymers and composites.

### Course Outcome

By the end of semester, students should be able to:

01: Analyze the materials structure, application, mechanical and physical properties of materials.

02: Analyze the phase diagram, phase transformation and the strengthening mechanism for metal alloys.

03: Evaluate various types of engineering materials (metals, ceramics, polymers and composites), their structure-properties relationship and processing method.

04: Analyze the characteristics of each engineering materials towards environmental and sustainability

BMM1722

ME Engineering Lab 1

Credit Hour: 2

Prerequisite: None

### Synopsis

This course introduces students with safe working habits, identify common materials used in metal fabrication, reading blueprints, identification, care & use basic measuring instruments, layout methods and essential hand tools. Emphasis is placed on the operation of metrology, benchwork, and lathe project.

### Course Outcome

By the end of semester, students should be able to:

- 01: Ability to describe the lathe machine, tooling's, and technical procedures.
- 02: Ability to demonstrate the appropriate techniques for the basic measuring instrument.
- 03: Ability to practice general safety for the mechanical laboratory activities.
- 04: Ability to interpret the mechanical laboratory works in a presentation.

KUK1213

Computer Programming for Engineers

Credit Hour: 3

Prerequisite: None

### Synopsis

This subject aims to introduce the fundamental element and feasibilities of the computer programming for engineers. The contents emphasis not only on the theoretical knowledge of programming but also the practical implementation in real-life situation. Students will learn basic structure of computer programming including variables and data types, input/output instruction, assignment instruction, decision instruction, repetition instruction, functions, arrays, string and reading/writing from/to text files. Students will be taught on developing a program to solve general engineering problems, mathematical equations and displaying the data via 2D and 3D graphs.

### Course Outcome

- 01: Apply the basic principles and concept of computer programming to solve engineering problems with utilization of mathematics & sciences knowledge.

02: Construct structure programming technique and develop a computer program using high level programming language to solve engineering problems.

03: Develop a solution using computer programming techniques and tools for solving engineering problems.

BMM1223

Dynamics

Credit Hour: 3

Prerequisite: BMM1213

### Synopsis

This course introduces kinematics (motion of rigid body) including of absolute motion(displacement, velocity and acceleration) and dynamics (forces, work, energy, inertia and momentum).

### Course Outcome

- 01: Understand the principle of kinematics of rigid body, kinetics of rigid body involving forces, work, energy, impulse and momentum.
- 02: Analyze the dynamics problem involving the kinematics of rigid body, kinetics of rigid body involving forces, work, energy, impulse and momentum.
- 03: Design a dynamic system based on principle of kinematics and kinetic of rigid body.
- 04: Investigate the kinematics and kinetics phenomena of a rigid body motion

BMM1233

Strength of Materials

Credit Hour: 3

Prerequisite: BMM1213

### Synopsis

This course introduces the concept of stress, stress and strain under axial loading, torsion, pure bending, analysis and design of beams for bending, shearing stresses in beam and thin-walled members.

### Course Outcome

By the end of semester, students should be able to:

- 01: Analyze stress/strain problems in structural members under axial loadings
- 02: Analyze the circular member problems which are subjected to torques
- 03: Analyze stress/strain problems in members under pure bending and transverse loading
- 04: Analyze and design of beams for bending

### BMM2513

Thermodynamics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course is designed to introduce basic concept in thermodynamic in a thorough way. Topics cover are properties of pure substances, thermodynamics system, the first law of thermodynamics for closed systems, open systems and their application in steady-flow and unsteady-flow processes, the second law of thermodynamics, entropy, introduction to refrigeration and steam power plant.

#### Course Outcome

By the end of semester, students should be able to:

- 01: To discover the state of properties from property diagram and obtaining data from property table.
- 02: To solve mass and energy balance of a process for both closed and open system by using the first law of thermodynamics.
- 03: To analyze the efficiency of a system (e.g., heat engine, heat pump, refrigerator) and its technical feasibility using the second law of thermodynamics and entropy concept.

### BMM2243

Advanced Strength of Materials

Credit Hour: 3

Prerequisite: BMM1233

#### Synopsis

This course introduces students to establish understanding in solid body mechanics including analyzing shearing stresses in beams and thin-walled members, understanding transformation of stress and

strain state, calculating stresses under combined loading, and analyzing effect of force to the deflection of beams and buckling of columns.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Analyze shearing stresses in beams and thin-walled members and transformations of stress and strain.
- 02: Evaluate the designed calculation based on state of stresses under combined loadings.
- 03: Analyze deflection and slope of a beam under transverse loading by using direct determination, singularity function, method of superposition and moment-area theorems.
- 04: Analyze stability of column by deriving Euler's formula for centric loading and Secant formula for eccentric loading.

### BMM2253

Fluid Mechanics

Credit Hour: 3

Prerequisite: None

#### Synopsis

To introduce the fundamental principles of fluid mechanics, the basic equations governing fluid statics and fluid kinematic, and the methods of solving engineering problems related to fluid mechanics. The covered topics are fluid properties, fluid static and dynamics, Bernoulli's equation and applications, momentum equation and its application, analysis of flow in pipeline system and dimensional analysis.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Recognize and describe the fundamentals of fluid mechanics
- 02: Apply the concept of fluid mechanics to overcome engineering problems
- 03: Analyze and find solutions to problems related to fluid mechanics

**BMM2313**  
Computer Aided design  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course introduces basic graphical communication, basic manual technical drawing, fundamentals of CAD software development, fundamentals of drawing by using design software, 2D and 3D related drawing commands for a better understanding for mechanical engineering purpose.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Analyze the fundamentals of 2D engineering drawing features and specification by using manual technical drawing method.
- 02: Evaluate the fundamentals of CAD software development.
- 03: Analyze the fundamentals of 3D engineering drawing features and specification by using CAD software.

**BMM2272**  
ME Engineering Lab 2  
Credit Hour: 2  
Prerequisite: BMM1213, BMM1113 & BMM1223.

#### Synopsis

This lab introduces engineering materials, statics, kinetics and kinematics through practical experiments. The covered topics for engineering materials experiments comprise steel microstructure microscopy, hardness test and heat treatment of metals while forces and precision friction measurement on an inclined plane are corresponding to the topics for statics experiments. The demonstration of mechanics, kinetics and kinematics concepts are experimentally investigated from tensile and compression test, bending and shearing, free fall and inertial in rotational motion.

#### Course Outcome

By the end of semester, students should be

able to:

- 01: Investigation of mechanical properties of materials such as hardness, friction coefficient and microstructure of materials after heat treatment.
- 02: Identify the common properties of material under tension, compression, bending moment, shearing force, free fall and kinematic of rigid body on incline plane through ethical engineering practice.
- 03: Organize and communicate the results of experimental work through well written report and effective presentation for dissemination of technical information.

**KUK2443**  
Numerical Methods & Optimization  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This subject teaches the techniques by which mathematical problems are formulated so that they can be solved with arithmetic operations. Topics covered in this subject are roots of equation, systems of linear algebraic equations, optimisation, curve fitting, numerical differentiation & integration, ordinary differential equation and partial differential equation. Some software packages are introduced to empower the students in problem solving.

#### Course Outcome

- 01: Optimise a process employing numerical methods.
- 02: Apply numerical methods as a problem-solving tool.
- 03: Solve optimisation & numerical methods problem by using software packages.

**BMM2523**  
Advanced Thermodynamics  
Credit Hour: 3  
Prerequisite: BMM2513

#### Synopsis

This course focuses on fundamental, application and evaluation of various

engineering thermodynamics systems. The course covers gas and vapor power cycles, refrigeration and heat pump, air conditioning system, and the concepts of chemical reactions in combustion process.

#### Course Outcome

By the end of semester, students should be able to:

01: Explain Concisely with complete analysis of the basic of thermodynamics gas power cycles included Otto Cycle, Diesel Cycle and Brayton Cycle.

02: Explain Concisely with extensive evaluation of the thermodynamics vapor power cycles with reheater, regeneration, cogeneration and combination with Brayton cycle for a better system performance.

03: Apply thermodynamics principles of vapor compression refrigeration cycle and Air Conditioning concept in analyzing performance of basic and innovative refrigeration systems and air quality requirement.

04: Analyze combustion equation, thermodynamic parameters and energy release in combustion process of common fuel.

#### BMM2263

Advanced Fluid Mechanics

Credit Hour: 3

Prerequisite: BMM2253

#### Synopsis

This course provides the students with the principal concepts and methods of advanced fluid mechanics. The topics covered include flow over immersed bodies, boundary layer analysis, compressible fluids flow, and applications in pumps and turbines. Students will work to formulate the models necessary to study, analyze, and design fluid systems through the application of the fluid concepts, and to develop the problem-solving skills essential to good engineering practice of fluid mechanics in practical applications.

#### Course Outcome

By the end of semester, students should be able to:

01: Attribute the basic concepts of various flows and determine their applications.

02: Evaluate problems related to external flow, boundary layer, and compressible flow.

03: Design solutions for complex problems related to flows through turbomachinery's and investigate solution at various flow parameters.

04: Demonstrate an understanding of the role the principles of fluid mechanics plays in design for sustainability.

#### BMM2712

Fundamental of Electrical Engineering

Credit Hour: 3

Prerequisite: None

#### Synopsis

This module will introduce students to basic science of electricity, introduction to instrumentation and measurement, work and energy theorem, basic AC and DC circuit and introduction to magnetism.

#### Course Outcome

01: Understand the fundamental of electrical and electronic engineering and its applications.

02: Solve basic DC and AC circuits by using Ohms Law and its related applications

#### KUK2142

Engineering Economics

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course deals with cost analysis in engineering decision-making, the management aspects and control of complex projects. Engineering economics topics include cost estimation, time value of money, interest formulas and equivalence calculations, measures of investment worth, depreciation and income tax analysis.

#### Course Outcome

01: To identify, formulate and analyze the economic feasibility of a plant, carried out by

examining the capital cost and the manufacturing cost obtained from the cost estimation techniques.

02: To apply theoretical and conceptual knowledge of financial statement, money-time relationship, depreciation and after-tax economic analysis to solve engineering economics problem.

03: To demonstrate understanding in economic decision-making process by applying the knowledge in the individual and teamwork tasks.

### BMM3533

Heat Transfer

Credit Hour: 3

Prerequisite: BMM2523

#### Synopsis

The basic modes of thermal energy transfer viz., conduction, convection and radiation are introduced with emphasis on understanding the fundamental concepts to be used in analyzing and solving real-life problems. The applicability of 1-D heat conduction in various geometries, the validity of one dimensional heat conduction in fins, the distinction between steady and unsteady states, the concept of boundary layer, the analogy between fluid flow and convective heat transfer, the distinction between free and forced convection, the properties of materials which are responsible for energy transfer by radiation, the principles in the design of heat exchangers with emphasized on fundamental concepts and design methods.

#### Course Outcome

By the end of semester, students should be able to:

01: Analyze the concept of conduction, convection and radiation heat transfer through appropriate mathematical equation.

02: Formulate and evaluate one-dimensional heat transfer for different geometries.

03: Formulate and evaluate one-dimensional heat transfer for different geometries.

04: Summarize the problem in simple radiation heat transfer.

05: Investigate the design of heat

exchanger for application in industries.

### BMM3413

Automatic Control

Credit Hour: 3

Prerequisite: BMM1223

#### Synopsis

This course introduces linear, time-invariant (LTI) control system modelling, design, and analysis. Topics covered are basic control system properties, frequency domain modelling of mechanical system, time response analysis, frequency response analysis, stability analysis, steady-state analysis, control system design using root locus, compensator and PID controller.

#### Course Outcome

By the end of semester, students should be able to:

01: Evaluate a control system model and properties.

02: Analyze a control system time response and frequency response.

03: Design a suitable controller for a control system using root locus, compensator and PID controller.

04: Investigate the stability of a control system using Routh-Hurwitz criteria and root locus.

### BMM3323

Mechanical Design

Credit Hour: 3

Prerequisite: BMM2243

#### Synopsis

This course is an introduction on design, modelling and best practices for use of machine elements such as bearings, springs, gears and mechanisms. Students are exposed to design and analysis of these elements based upon fundamental of physics, mathematics and core mechanical engineering principles (statics, solid mechanics, manufacturing, computer simulation, etc.)

#### Course Outcome

By the end of semester, students should be able to:

- 01: Evaluate the components to prevent failure due to statics and dynamics service load and access the suitable helical compression spring using table of parameters.
- 02: Design the shafts for fatigue failure, and bolts, nuts, and screws for statics failure, as well as welding parameters in torsion and bending.
- 03: Design analysis and evaluate of bearings selection and analyze welding cases that involved torsion and bending.
- 04: Design assessment of gears for bending and wear conditions.

#### BMM3282

ME Engineering Lab 3

Credit Hour: 2

Prerequisite: BMM2263 & BMM2523

#### Synopsis

This lab introduces students to the fundamental concepts and practical applications of thermo-fluids and heat transfer experimentation, from the virtual instrumentation and data acquisition requirements to subsequent data analysis techniques. It covers the areas of flow patterns over different immersed bodies, fluid flow determination and validation of Bernoulli's theorem, pumps and systems, turbines, friction losses in pipes, properties of pure substances, first and second laws of thermodynamics, ideal and perfect gas characteristics, refrigeration cycles, heat conduction, heat convection, as well as heat radiation.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Implement fluid dynamics, thermodynamics, and heat transfer knowledge to investigate the thermofluidic behavior via suitable experimental setup.
- 02: Demonstrate professional ethics and responsibilities to complete the laboratory tasks.
- 03: Interpret the findings from experiment

with thermo-fluids fundamental and appropriate data analyses by writing effective report.

#### BMM3731

Introductory Six Sigma

Credit Hour: 1

Prerequisite: None

#### Synopsis

This course describes partially the methodologies of six sigma by defining and measuring the problem which faced by the organization. It is comprising various tools and techniques for defining and measuring the real problem. At the end of this course the student will be able to identify and prioritize the main problem for improvement.

#### Course Outcome

By the end of semester, students should be able to:

- 01: To apply six sigma tools and techniques in defining the actual problem.
- 02: To measure the selected problem through performance measurement.
- 03: To organize the seriousness of identified problem based on basic statistical tools.

#### BMM3753

Manufacturing Processes

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces students to the fundamental of manufacturing processes which are used to convert raw materials into finished products. Various processes, machinery, and operations will be discussed with emphasis on understanding the fundamental of engineering materials and processing parameters that influence design considerations, product quality, and production costs. This course also will introduce students to sustainable manufacturing which one of the important aspects of modern manufacturing.

#### Course Outcome

- 01: Evaluate different types of metal & polymer solidification processes.
- 02: Interpret forming processes for bulk metal, sheet metal and powder metallurgy.
- 03: Justify major types of material removal process, joining process and sustainable manufacturing.
- 04: Formulate a process flow to manufacture a conceptual product by considering sustainable manufacturing process.

KUK3022

Engineering in society

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course introduces the engineering profession, engineers and research, ethics and public responsibility, engineer and law, and contract law.

#### Course Outcome

- 01: Describe the understanding of engineering profession, accreditations and professional bodies.
- 02: Explain the ethics, public responsibility and the laws in engineering practise.
- 03: Display effective leadership and teamworking ability in completing the report and presentation.

BMM3423

Measurements & Instrumentation

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the principles of measurement, signal analysis and provides the students hands-on laboratory experience with a variety (or selected) transducers and instruments (including 'virtual instruments'). Students also expose on how to write professional technical reports.

#### Course Outcome

- 01: Explain in details the basic element in measurement and instrumentation system; and fundamental of selected important transducers.
- 02: Justify the appropriate/suitable basic of signal analysis in measuring analogue signal from transducers.
- 03: Design virtual instrumentation system to acquire data from transducer and analyse the data in time and frequency domain.
- 04: Integrate between physical demonstration and oral presentation to deliver project outcome.

BMM3613

Mechanical Vibrations

Credit Hour: 3

Prerequisite: BMM1223

#### Synopsis

This course introduces fundamental concepts of vibration, vibration analysis for systems with single and multi-degree of freedom, vibration control and vibration analysis...

#### Course Outcome

By the end of semester, students should be able to:

- 01: Determine the natural frequency and mode shape of a vibrating system.
- 02: Analyze the dynamic responses of a vibrating system.
- 03: Formulate and evaluate the solutions to vibration problems.
- 04: Analyze vibration system using numerical and simulation data.

BMM3293

Finite Element Methods

Credit Hour: 3

Prerequisite: BMM2243

#### Synopsis

This course introduces the finite element method for solid mechanics. Topics covered includes basic concept of finite element method, spring, bar, truss, and constant-strain triangular elements. It also introduces the application of finite element method software to solve common mechanical problems.



### Course Outcome

- 01: Interpret the problems in mechanics using the finite element method concept.
- 02: Formulate the solution and analysis of a finite element problem involving spring, bar, truss, and constant-strain triangular elements.
- 03: Evaluate a solid mechanics design using finite element method.
- 04: Construct the solution and analysis of a solid mechanics problem using finite element software.

### BMM3331

Integrated Design Project 1

Credit Hour: 1

Prerequisite: BMM3323

### Synopsis

This course prepares a detailed comprehensive design project focusing on design and development the product. The students will learn about project management, communication, documentation, working in teams and design methodology. Students has to include the application of the design process to solve the complex engineering problem. The projects challenge students to apply the knowledge and skills they learned throughout their degree to real-world problems. Each team produces detailed drawings, a presentation and concept design report at the end of the semester.

### Course Outcome

By the end of semester, students should be able to:

- 01: Develop suitable solution to the complex engineering problem.
- 02: Work in a team effectively as an individual and in a group.
- 03: Identify current issues in engineering industries.

### BMM3741

Intermediate Six Sigma

Credit Hour: 1

Prerequisite: BMM3731

### Synopsis

This course describes partially methodologies of six sigma in analyzing and improving the problem which faced by the organization. Its comprising various tools and techniques for analyzing and improving. At the end of this course the student will be able to perform analysis on the discovered problem and able to identify the potential improvement.

### Course Outcome

By the end of semester, students should be able to:

- 01: To brainstorm on potential root causes to the identified problem.
- 02: To analyze a problem by using statistical analysis tools.
- 03: To identify the list of improvement for discovered problem

### BMM3762

ME Engineering Lab 4

Credit Hour: 2

Prerequisite: BMM3753

### Synopsis

This course introduces basic understanding through experiments of basic automotive system applied in common vehicle. The experiments cover internal combustion engine, automotive braking system, gearing system, Radiator cooling system and steering system.

### Course Outcome

By the end of semester, students should be able to:

- 01: Dress safely for the laboratory, behave safely in the laboratory, recognize the importance of keeping the laboratory clean and tidy, and demonstrate on awareness of the laboratory safety rules written in the safety contract.
- 02: To implement automotive engineering knowledge for the investigation of behavior in automotive systems through suitable experimental setup.
- 03: To demonstrate detailed experimental methods and present experiments result to prove working principles of systems in

automotive.

KUK3562

Occupational Safety & Health

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course describes the processes of managing occupational safety and health (OSH) matters in an organization. It introduces the Malaysian OSH Acts and Regulations, OSH Standards, OSH programs that need to be carried out to minimize hazards, risks, accidents and health effects among workers at workplace in the organization.

#### Course Outcome

01: Apply the principles and system requirements of Occupational Safety and Health in organization.

02: Evaluate Occupational Safety and Health management programs related to the hazards.

03: Perform the investigation on industrial accident.

04: Prepare safety management program to organization.

BMM3995

Industrial Training

Credit Hour: 5

Prerequisite: None

#### Synopsis

This course introduces students to industrial training, expose them to professional skills and experience in the aspect of mechanical engineering field. The exposure will help to produce an excellent, responsible with good ethical for their personal development.

#### Course Outcome

By the end of semester, students should be able to:

01: Response and comply with the importance of society, environment and sustainability in engineering practices,

decisions, and solutions.

02: Practice the professionalism and work etiquette that comply to be a good and responsible engineer.

03: Communicate effectively on complex engineering activities such as being able to comprehend and write effective reports and design documentation and make effective presentations.

04: Practice and contribute taught theories to solve real time problem through involvement in various scopes of works such as planning concept, design, construction & project administration.

BMM4812

Undergraduate Research Project 1

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course is designed to expose students to research project. Students ought to apply the knowledge they have learned in the program to complete the research project. Every student will be supervised by an academic in doing literature survey and preparing part undergraduate thesis which contains objective of the project, problem statement, literature survey, methodology, preliminary results and references. At the end of this subject, the students are required to present their findings to their supervisor and faculty's panel.

#### Course Outcome

By the end of semester, students should be able to:

01: To identify and analyze research problems using the principles of mathematics, natural sciences or engineering science.

02: To design and develop solutions based on research problems.

03: To communicate effectively on research outcomes with the engineering community and society (oral and written).

04: To engage in independent and life-long learning in the broader context of technological change, enhance individual's soft skill and organization skills in research activities.

BMM4343  
Integrated Design Project 2  
Credit Hour: 3  
Prerequisite: BMM3331

#### Synopsis

This course is a continuation of BMM3331 Integrated Design Project 1 where it is totally on the execution/fabrication and related analyses of the system/machine. Students work in small teams under the close supervision of faculty members. Each team produces comprehensive specifications, a presentation, and a prototype of the proposed design. They also write reports and prepare presentations describing their work. All reports are expected to meet professional standards.

#### Course Outcome

By the end of semester, students should be able to:

- 01: Analyze and propose solutions for project complex engineering problem.
- 02: Develop suitable solution to the complex engineering problem.
- 03: Design systems that includes components or processes using modern tool in complex engineering problem.
- 04: Develop sustainable design system.
- 05: Work in a team effectively as an individual and in a group.
- 06: Instill critical thinking, independent, rational inquiry and self-directed learning.
- 07: Apply the theory of management principles and engineering to manage project.
- 08: Identify current issues in engineering industries.

BMM4771  
Advance Six Sigma  
Credit Hour: 1  
Prerequisite: BMM3741

#### Synopsis

This course describes the knowledge of implementing six sigma in the organisation. The student will apply six sigma knowledges into the provided case study. This subject comprises of improve and control/verify phase which including various tools and techniques

for improvement. At the end of this course, the student will be able to apply and recommend the guideline for six sigma implementations from a beginning until the final solution.

#### Course Outcome

- 01: To apply various tools and techniques for quality improvement.
- 02: To determine the control activities for betterment in operation or services.
- 03: To organise the priority of challenges and barriers in implementing six sigma

KUK4412  
Project Management  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This subject introduces the concept of project management which will provide the students with the knowledge of managing projects. As an introduction, students will be given general information on project life cycle and management. Then they will be given exposure to different techniques of project scheduling, monitoring and resource management.

#### Course Outcome

- 01: Describe the elements phases involve in project lifecycle.
- 02: Differentiate types of project organization and explain the role of stakeholders in the project management.
- 03: Plan a project work program and apply techniques for resource management.
- 04: Apply and develop project planning and scheduling tasks into appropriate planning software.

BMM4824  
Undergraduate Research Project 2  
Credit Hour: 4  
Prerequisite: BMM4812

#### Synopsis

This course is designed to expose students to research project. Students ought to apply the knowledge they have learned in the program

to complete the research project. Every student will be supervised by an academic in doing literature survey and preparing part undergraduate thesis which contains objective of the project, problem statement, literature survey, methodology, preliminary results and references. At the end of this subject, the students are required to present their findings to their supervisor and faculty's panel.

#### Course Outcome

By the end of semester, students should be able to:

01: To identify and analyze research problems using the principles of mathematics, natural sciences or engineering science.

02: To design and develop solutions based on research problems.

03: To conduct investigation on research problems including design of experiments, analysis and data interpretation, and conclusion.

04: To practice the use of modern tools in science and engineering

05: To communicate effectively on research outcomes with the engineering community and society (oral and written).

06: To engage in independent and life-long learning in the broader context of technological change, enhance individual's soft skill and organization skills in research activities.

#### BMM Elective Courses

##### BMM4213

Biomechanics & Biomedical Engineering

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the principles and theories of biomechanics and biomedical engineering. The contents include basic concept of biomechanics on human movement, biomedical engineering components, musculoskeletal system, sport medicine and rehabilitation, human cardiovascular and respiratory system. Some equipment/machine are introduced to

empower the student in problem solving.

#### Course Outcome

01: Attribute the basic concepts of biomechanics on human movement and biomedical engineering components.

02: Identify the requirement on musculoskeletal system, sport medicine and rehabilitation from biomechanics perspective.

03: Investigate the biomedical engineering in human cardiovascular and respiratory system to perform specific task.

04: Design the human system requirement focuses on specific biomedical devices and analyze using modeling of biomedical analysis or qualitative and quantitative approaches.

##### BMM4413

Hydraulics & Pneumatics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces hydraulic and pneumatic systems, including the theoretical knowledge, components and the circuit design. Beside the basic hydraulic and pneumatic system, this course also introduces the electro fluid power system, as well as programmable logic controller (PLC) to control the system.

#### Course Outcome

01: Demonstrate fundamental fluid power knowledge in basic pneumatics system.

02: Analyze hydraulics system requirement for optimum performance.

03: Design an advanced electro-hydraulics and electro-pneumatics system.

04: Devise a hydraulics and pneumatics system using programmable logic controller.

##### BMM4313

Mechanism Design

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the fundamental and design of mechanism. Theory of mechanism will be carried out in series of lectures and

analysis and design of mechanism will be carried out in integrated project. Topics that will be covered are mechanisms and kinematics, vector and position analysis, velocity analysis, acceleration analysis and cam design.

#### Course Outcome

01: Identify mechanism and design mechanism parameters related to motion, degree of freedom and analyze the position of the links in a mechanism.

02: Analyze the velocities and accelerations of links and points on mechanisms.

03: Design and construct the cam profile/mechanism and design mechanisms system using synthesis and analysis method.

04: Use related computer programs to design, model and analyze mechanisms.

#### BMM4513

Power Plant Technology

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course discusses thermal based power generation such as steam power plant, gas power plant, combined cycle power plants and sustainable energy power systems. This course also covers fuels and combustions in power plant, cogeneration and trigeneration in power plant system, and environmental issues on power generation. Special topic of thermal based power generation also covered in this course which related to sustainable and renewable power generation.

#### Course Outcome

01: Analyze steam and gas power plants based on thermodynamics principle.

02: Analyse fuels and combustions for steam and gas power plants based on chemical equation and thermodynamics analysis.

03: Evaluate performance of combined cycle, co-generation and sustainable power generation systems of power plant.

04: Explain environmental problems and related issues in power plant and energy generation and propose engineering solution

for the problem.

#### BMM4223

Computational Fluid Dynamics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This subject aims to introduce the principal concepts and methods of Computational Fluid Dynamics (CFD) for solving thermo-fluid problems. It starts with the introduction of the basic (governing) equations that represent the thermo-fluid problems and the theory of CFD based on the Finite Volume Method. In addition, an awareness of the limitations of CFD codes and their applications to fluid and heat transfer problems are also included. The last part of this introductory course focuses on solving some practical problems utilizing commercial software.

#### Course Outcome

01: Attribute the main elements of CFD and the governing equations that represent flow and heat transfer problems.

02: Evaluate the flow and energy governing equations using various discretization techniques.

03: Design solutions for complex problems using various velocity-pressure coupling methods and perform error analysis.

04: Develop a CFD simulation model and investigate the performance of the model at various conditions.

#### BMM4233

Corrosion Science & Engineering

Credit Hour: 3

Prerequisite: None

#### Synopsis

The course aims to investigate the fundamental causes of corrosion problems and its protection method. This course emphasizing the basic theory on electrochemistry including the corrosion reactions, thermodynamics and kinetics of corrosion, types of corrosive environment, forms of corrosion on structural material, the corrosion protection method including material

selections, environment modification and cathodic protection, types and procedures of corrosion testing and also method to inspect and monitor corrosion. For project assignment, students involve with experiments and modelling to evaluate corrosion reactions, environmental failure, and basic methods for protection of materials.

#### Course Outcome

- 01: Evaluate the basic principle of electrochemistry of aqueous corrosion and justifying the thermodynamics and kinetics of corrosion.
- 02: Identify the main types of corrosive environment and its condition.
- 03: Analyse the forms of corrosion and corrosion failure in industrial application and propose method for corrosion protection.
- 04: Justify types of corrosion testing and elaborate the corrosion inspection and monitoring method

BMM4723

Ergonomics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces students to ergonomics principles and their application in the design of work, equipment and the workplace. Consideration is given to musculoskeletal disorders, manual handling, and ergonomics aspects of the workplace.

#### Course Outcome

- 01: Understand and apply ergonomic principles to the creation of safer, healthier and more efficient and effective activities in the workplace.
- 02: Understand the causes of work-related Musculoskeletal Disorders at the workplace.
- 03: Apply ergonomic risk assessments and appropriate measures.
- 03: Analyze ergonomically workplace layout and motions at the workplace.

BMM4733

Production Planning & Control

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the elements of Production Planning and Control. Its comprise of project management, forecasting methods, aggregate planning, scheduling, material requirement planning and lean manufacturing. At the end of semester, the student will have a knowledge on the coordination of resources and facilities to meet the optimum cost in the organization.

#### Course Outcome

- 01: Develop a project management with CPM, PERT and cost-time-trade off.
- 02: Apply quantitative and qualitative methods to forecast a demand.
- 03: Analyse the aggregate planning by using level, chase, mixed and transportation methods.
- 04: Recommend the best methods of Lean manufacturing and material requirement planning to be implemented in a selected case study.

BMM4743

Quality Engineering

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces students to fundamentals of quality management and statistical quality improvement concepts. A practical state-of-the-art approach is stressed to ensure sufficient theory is presented to develop robust understandings on quality principles to monitor, control, improve product and processes.

#### Course Outcome

- 01: Apply quality management concepts.
- 02: Apply and analyse the findings from various types of quality tools.
- 03: Develop quality monitoring plan using quality concepts and tools.
- 04: Investigate the findings from quality statistical process control tools.

BMM4252  
Continuum Solid Mechanics  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course introduces the modelling of the mechanical behavior of materials using continuum mass rather than discrete particles. The content of the course includes the introduction to tensor notation, kinematics of continuum, deformation and strain, stress tensor, and linear and non-linear constitutive equations for materials. In addition, the application of continuum mechanics using MATLAB will be introduced.

#### Course Outcome

- 01: Apply tensorial and matrix algebra in Cartesian and curvilinear coordinate system for continuum mechanics problem.
- 02: Analyze the motion, deformation and stresses of a given continuum mechanics problems.
- 03: Evaluate the constitutive equations of materials for solid mechanical applications.
- 04: Investigate numerically the stress and deformation of a given continuum mechanics problems.

BMM4713  
Metal Casting  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course introduces students to the fundamental of metal casting process which are used to produce metal products. This course also will exposed students to the fundamental of metal casting process, apparatus, design consideration and material selection process.

#### Course Outcome

- 01: Outline the fundamental of metal casting process, technology and principle.
- 02: Interpret the relationship between pattern design, mould design and molten metal pouring.
- 03: Analyze the casting defects, quality

control and near neat shape casting.  
04: Formulate a process flow to produce products from metal castings process.

BMM4113  
Advanced Material Characterisation Theories & Tools  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

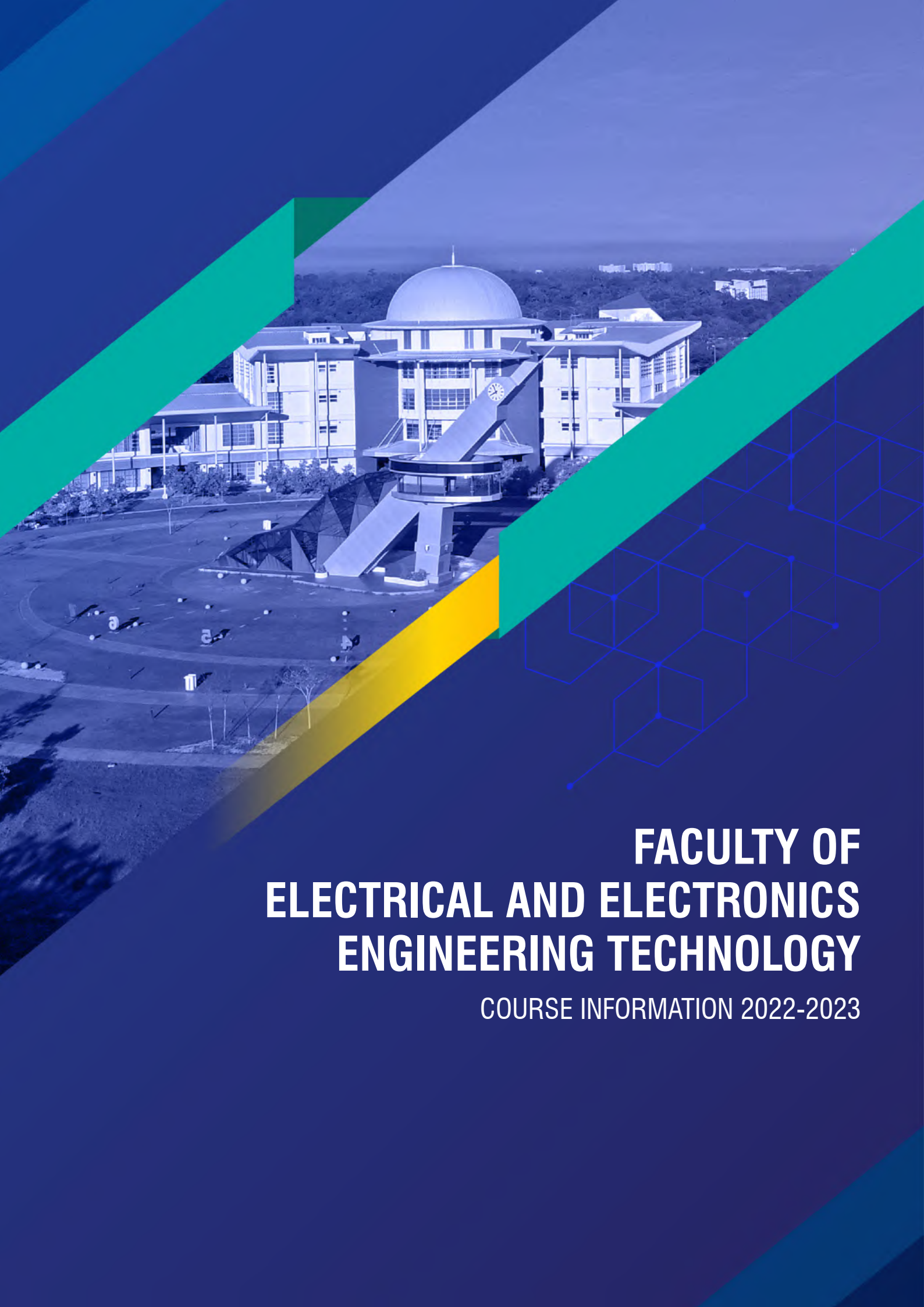
The objective of this course is to give the students skills in advanced methods for materials characterization in order that they can select the most suitable one for a specific property as, for example, the in-depth characterization of a material at a nanometric level. For that, the students have access to the available testing equipments, to perform several practical and laboratorial works which will be presented as scientific and technical reports. The experimental skills of the students in performing research work are also goals to be achieved in this course.

#### Course Outcome

- 01: Fundamental theoretical knowledge of each technique or method will be given and evaluated.
- 02: Students have to solve and to analyse a real problem typical of an engineering case.
- 03: The investigation is performed in groups of 2 students who should use different characterization techniques depending on the case-study.
- 04: Students should write a report and defend it in front of a jury.







# **FACULTY OF ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY**

**COURSE INFORMATION 2022-2023**

## CURRICULUM STRUCTURE BACHELOR OF ELECTRICAL (ELECTRONIC) ENGINEERING WITH HONOURS

YEAR SEMESTER	FIRST		SECOND		THIRD		FOURTH		FIFTH
	1	2	3	4	5	6	7	8	9
<b>COURSES</b>	BHE1113 Circuit Analysis 1	BHE1123 Circuit Analysis 2	BHE2213 Electronics	BHE2233 Signals & Systems	BHE3513 Data Communications	BHE3223 Analog System Design	BHE4812 Internship	BHE4513 Digital Signal Transmission	UQB***2 Co- Curriculum
	BHE1213 Digital Electronics	BHE1413 Computer Programming	BHE2413 Object- Oriented Programming	BHE2223 Microcontroller Systems	BHE3533 Principles of Communication Systems	BHE3313 Control Systems	BHE4821 Internship Follow-up	BHE4522 Cellular Networks	BHE4735 Bachelor Thesis
	BUM2143 Applied Calculus	BHE1313 Instrumentation & Measurement	BUM2313 Numerical Methods	BHE2133 Electromagnetic Fields	BHE3412 Numerical Programming	BHE3523 RF Circuit Design		BHE4223 Digital Signal Processing	BHE4741 Final Thesis Examination
	BHE1012 Physics	BHE1022 Business Administration	BHE2113 Electrical Power Systems & Analysis	BHE2123 Power Electronics Drives & Applications	BHE3812 Internship Preparation	BHE3233 Digital System Design		BHE4212 Digital Signal Processor	
	UHS1022 Soft Skills	BUM2153 Ordinary Differential Equation	BHE2012 OSHA & Engineer and Society	BUM2443 Applied Statistics	BHE3113 Electrical Machines & Drives	BHE3423 Algorithm & Data Structure		BHE4***3 Elective	
	UHC1012 Falsafah dan Isu Semasa		UHC2022 Penghayatan Etika dan Peradaban		BHE3123 Electrical Power Generation, Utilization & High Voltage	BHE3432 Computer Vision Systems		BHE4714 Team Oriented Project Study	
<b>GERMAN LANGUAGE</b>	UHD2313 German A1	UHD2323 German A2	UHD2343 German B1.2		UGE2002 Techno- preneurship				
<b>TOTAL CREDIT/SEM</b>	<b>18</b>	<b>17</b>	<b>19</b>	<b>15</b>	<b>18</b>	<b>17</b>	<b>13</b>	<b>17</b>	<b>8</b>
<b>TOTAL ALL CREDIT</b>	<b>145</b>								

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	Graduates achieve advanced standing professionally based on their technical expertise and accomplishment related to engineering practice and research, or in other fields they choose to pursue.
PEO2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.
PEO3	Graduates demonstrate commitment to the community and the professions, holding responsible positions that contribute to the benefits of the society.

PROGRAMME OUTCOMES (PO)	
PO1	<b>Engineering Knowledge</b> Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation to the solution of complex electrical and electronics engineering problems.
PO2	<b>Problem Analysis</b> Identify, formulate, conduct research literature and analyse complex electrical and electronics engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	<b>Design/Development of Solutions</b> Design solutions for complex electrical and electronics engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PO4	<b>Investigation</b> Conduct investigation of complex electronics/electrical engineering problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
PO5	<b>Modern Tool Usage</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering problems, with an understanding of the limitations.
PO6	<b>The Engineer and Society</b> Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems.
PO7	<b>Environment and Sustainability</b> Understand and evaluate the sustainability and impact of professional engineering work in the solutions of complex engineering problems in societal and environmental contexts.
PO8	<b>Ethics</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
PO9	<b>Individual and Teamwork</b> Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
PO10	<b>Communication</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write

	effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	<b>Project Management and Finance</b> Demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.
PO12	<b>Life-long Learning</b> Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

**COURSE SYNOPSIS (CORE FACULTY)****BHE1113 Circuit Analysis I****Credit: 3****Pre-Requisite: None****Synopsis**

This course introduces the basic concepts and engineering methods of DC circuit analysis. The contents include Ohm's Law, Kirchhoff's Law, series and parallel circuits, Mesh and Nodal analysis, Superposition, Source Transformation, Thevenin's and Norton's theorems, Capacitor, Inductor and responses of First Order circuits.

**BHE1213 Digital Electronics****Credit: 3****Pre-Requisite: None****Synopsis**

This course emphasizes on the fundamental of digital electronics. The student is first taught about the number system and logic gates before introducing them to digital IC technology. Then they are exposed to both combinational logic network and combinational MSI logic. In concurrence with this, the fundamental of sequential logic, flip-flop, counter and shift register will be taught. Finally, the memory devices are introduced.

**BHE1012 Physics****Credit: 2****Pre-Requisite: None****Synopsis**

This course introduces the basic concepts and fundamentals of Physics that can be applied to electrical, electronics and electromagnetic fields domains. The contents cover mechanics, electromagnetic fields, waves and optics. It is important course for the electrical engineering students to understand as a preparation towards more extensive knowledge of electrical and electronics engineering courses.

**BHE1123 Circuit Analysis II****Credit: 3****Pre-Requisite: BHE1113****Synopsis**

This course provides the basic concepts and engineering methods of AC circuits. The contents include applications of Mesh and Nodal analysis, Superposition and Source Transformation Theorems, Thevenin and Norton Theorem. Resonant circuit, second order circuit and Balanced 3-phase circuits are also covered.

**BHE1413 Computer Programming****Credit: 3****Pre-Requisite: None****Synopsis**

This course presents the C programming language for electrical & electronics engineer. The contents emphasis not only on the theoretical knowledge of programming but also the practical implementation in real-life situation. Students will learn basic structure of computer programming.

**BHE1313 Instrumentation and Measurements****Credit: 3****Pre-Requisite: None****Synopsis**

This course introduces students to the principles of instrumentation and measurements, determination of error that caused by the meters. The students will be exposed to the architecture and the operation of DC and AC meters, oscilloscope, signal generator, sensors and transducers, analysis of DC and AC meters and introduction to signal conditioning

**BHE1022 Business Administration****Credit: 2****Pre-Requisite: None****Synopsis**

This course introduces students to the basic and principles knowledge of business

administration. The students will be exposed to the business management, administration and human resource functions, purchasing and marketing functions, financial management and provide cost estimation. This course will inculcate technopreneurs knowledge amongst the electrical and electronics engineering students.

### **BHE2213 Electronics**

**Credit: 3**

**Pre-Requisite: BHE1113**

#### **Synopsis**

This course introduces the fundamental of semiconductor devices which are diodes and transistors. It also describes BJT transistors operational characteristic that covers the DC and AC analysis. In addition, the various type of BJT configuration will be examined and analyzed. Furthermore, the analysis of the amplifier circuit will be extended to its frequency response.

### **BHE2413 Object Oriented Programming**

**Credit: 3**

**Pre-Requisite: None**

#### **Synopsis**

This course presents the object-oriented programming for electrical and electronic engineer. The contents emphasis not only on the theoretical knowledge of object-oriented principles but also the practical implementation that include creating modular, flexible and reusable software. Students will learn the concepts of class, method, constructor, instance, data abstraction, function abstraction, inheritance, overriding, overloading, and polymorphism.

### **BHE2113 Electrical Power Systems & Analysis**

**Credit: 3**

**Pre-Requisite: BHE1123**

#### **Synopsis**

This course introduces students to the concept

of electrical and power system analysis, which are the overview of power system, power flow methods and fault analysis. The students will be exposed to the per - unit system calculations, power flow problem analysis and balance and unbalanced fault analysis. It is intended the students to understand the problems commonly encountered in power system engineering practice, analysis and techniques applied to solve some practical problems in power systems.

### **BHE2012 OSHA & Engineer and Society**

**Credit: 2**

**Pre-Requisite: None**

#### **Synopsis**

The course aims to ensure worker safety and health by working with employers to create better working environments. Outreach, education, and compliance assistance enable OSHA to play a vital role in preventing on-the-job injuries and illnesses. At the end of this course, students will be able to establish safety and health programs and identifying and correcting workplace hazards. This course also exposes students to gain a deeper understanding of the ethical and laws issues and dilemmas that arise in one or more areas in professional conduct and their responsibility to society. It also intended to develop students to understand the academic responsibility and accountability of a profession in engineering and the organizational activities of professional engineering institutions.

### **BHE2233 Signals and Systems**

**Credit: 3**

**Pre-Requisite: BHE1113 & BUM2153**

#### **Synopsis**

This course introduces the students to various signals transformation techniques and its application to electrical circuits. This includes Fourier Series, Fourier Transforms and Laplace Transform. The concept of frequency response is introduced in filter.

### **BHE2223 Microcontroller Systems**

**Credit: 3****Pre-Requisite: BHE1413 & BHE1213****Synopsis**

This course exposes students to the microcontroller in term of programming and hardware configurations. Beginning with understanding of microcontroller architecture, the programming software is applied to configure for several applications such as DI, DO, AI, ADC, and PWM. In addition, students are exposed to the integration between microcontroller and external devices.

**BHE2133 Electromagnetic Fields Theory****Credit: 3****Pre-Requisite: BUM2153****Synopsis**

This course introduces students on the importance and the applications of the Electromagnetic Fields Theory in the Electrical Engineering courses. The syllabus covered includes the concepts of electrostatic field, magnetostatic field and electromagnetic field (time varying field).

**BHE2123 Power Electronics Drives & Applications****Credit: 3****Pre-Requisite: BHE2213****Synopsis**

The primary objective of this course is to give students a foundation of knowledge, understanding, analysis and design of power electronics circuits for energy conversion. This course presents concepts, fundamental analysis tools, and a range of power electronics applications. Intermediate level simulation activities will also be conducted.

**BHE3513 Data Communications****Credit: 3****Pre-Requisite: None****Synopsis**

This course emphasizes the importance and the applications of the Data Communications in the Electrical & Electronics Engineering courses. The syllabus covers Queue theory, data communications, communication networks, OSI and TCP/IP protocol suite and their application to optimal network design.

**BHE3533 Principle of Communication Systems****Credit: 3****Pre-Requisite: BHE1113****Synopsis**

This course introduces theories in the area of communication systems. Topics covered include the basic elements of communications, signal analysis, amplitude modulation, angle modulations and digital modulations, as well as transmission channels and noise impact on the modulation system. Finally, some emergence of digital communication technologies is presented and compared.

**BHE3412 Numerical Programming****Credit: 2****Pre-Requisite: None****Synopsis**

This course covers how to handle the numeric standard tools using MATLAB and Simulink of differential equations and modelling simple dynamic systems with MATLAB and Simulink.

**BHE3113 Electrical Machines & Drives****Credit: 3****Pre-Requisite: BHE1123 & BHE2133****Synopsis**

This course introduces the fundamental concepts and principles of transformer and various types of electrical machines. It is intended for students to understand fundamental aspects of rotating electrical machines. The first part of the course is a quick review of some electromagnetism fundamental while the following will deal with

the transformers and different types of electrical machines.

### **BHE3123 Electrical Power Generation, Utilization & High Voltage**

**Credit: 3**

**Pre-Requisite: BHE2113 & BHE2133**

#### **Synopsis**

This course introduce student to three contents including power generation, power utilization and high voltage. In the end of this course, student should possess understanding of electricity tariff calculation, able to choose energy efficient equipment and able describe how electrical breakdown occurs in insulation material. Furthermore, this course will help student to integrate knowledge from earlier level of the programme thus help to understand electrical engineering better.

### **BHE3812 Internship Preparation**

**Credit: 2**

**Pre-Requisite: None**

#### **Synopsis**

This course exposes the students to professional skills and experience in aspect of electrical engineering practice. The exposure will help to produce an excellent, responsible, and good attitude student.

### **BHE3223 Analog System Design**

**Credit: 3**

**Pre-Requisite: BHE2213**

#### **Synopsis**

This course introduces the fundamental of semiconductor devices which are transistors. It also describes Field-Effect Transistor (FET) operational characteristic that covers the DC and AC analysis. Some important devices such as op-amp and active filters are also introduced. Towards the end of this course, students are exposed to the applications of these semiconductor devices. During the laboratory sessions, students are expected

to demonstrate and troubleshoot basic semiconductor device circuits.

### **BHE3313 Control Systems**

**Credit: 3**

**Pre-Requisite: None**

#### **Synopsis**

This course introduces students to the control system technology, mathematical models of feedback systems. The students will be exposed to transient and steady-state analysis, root locus, frequency response and analysis design of compensator. Students will utilize Matlab and Simulink software for simulating PID controller and will be exposed to PID controller trainer on actual implementation of the designed PID.

### **BHE3523 RF Circuit Design**

**Credit: 3**

**Pre-Requisite: BHE3533**

#### **Synopsis**

This course emphasizes on the theory and principles of designing RF circuit in communication electronics system. The design of the RF circuit involves transmission line theory & waveguide, network analysis, impedance matching, active & passive RF circuits such as RF filters, amplifiers, RF mixers, and RF oscillators.

### **BHE3233 Digital System Design**

**Credit: 3**

**Pre-Requisite: None**

#### **Synopsis**

In this course, digital design is taught at a higher level of abstraction than the Digital Electronics course. It provides an in-depth coverage of systematically development and synthesis of digital system with emphasis on Field Programmable Gate Array (FPGA) technology. It covers with the proper planning techniques, design strategy and tools, functional verification, and system implementation. The information gained can



be applied to any digital design by using a top-down synthesis design approach. Through this course, student will be able to create digital design faster, shorten development time and lower the development costs.

### **BHE3423 Algorithm & Data Structure**

**Credit: 3**

**Pre-Requisite: None**

#### **Synopsis**

The aim of the course is that students will develop knowledge and understanding of algorithms and data structures. The student will also develop skills to apply algorithm and data structure theory in practice.

### **BHE3432 Computer Vision Systems**

**Credit: 2**

**Pre-Requisite: None**

#### **Synopsis**

This course introduces students to the principles of Computer Vision which includes image formation and low-level image processing, theory, and techniques for extracting features from images, measuring shape and location, and recognizing and classifying objects. Student will be exposed to design project using image processing software.

### **BHE4812 Internship**

**Credit: 12**

**Pre-Requisite: None**

#### **Synopsis**

This course is practical task in an industrial company or related with the appropriate training for the duration of 6 months. The student involved in actual project of the company from the fields of development, production or distribution. The projects studied by the students deal with topics from the electrical and electronics engineering and related fields and allow the practical application of the knowledge acquired at the university. It provides an insight view to the future professional life. The students are

responsible to find a suitable project at the training company.

### **BHE4821 Internship Follow-up**

**Credit: 1**

**Pre-Requisite: None**

#### **Synopsis**

This training exposes the students to professional skills and experience in aspect of electrical and electronics engineering practice. The exposure will help to produce an excellent, responsible, and good attitude student.

### **BHE4513 Digital Signal Transmission**

**Credit: 3**

**Pre-Requisite: None**

#### **Synopsis**

This course introduces students with the knowledge of signal processing in digital communications, optimal receiver, methods for clock and carrier synchronization, spread spectrum technology (CDMA) and its application (UMTS), multicarrier methods (OFDM) and their applications (DAB, DVB, WLAN, LTE, xDSL), modelling, simulation and evaluation of transmission systems using Matlab/Simulink.

### **BHE4522 Cellular Networks**

**Credit: 2**

**Pre-Requisite: None**

#### **Synopsis**

This course introduces students with basics of mobile communication, the mobile radio channel and its modelling, network and protocol architectures of mobile radio systems, mobility support system, mobile radio systems of the 3<sup>rd</sup> generation (UMTS, HSPA) and 4th generation (LTE, LTE-A).

### **BHE4223 Digital Signal Processing**

**Credit: 3**

**Pre-Requisite: BHE2233**

**Synopsis**

This course introduces students to the fundamentals of Digital Signal Processing (DSP) including sampling theorems, Discrete-Time Systems (DTS) structures, Linear Time-invariant (LTI) systems analysis, z-transform, Discrete Fourier Transform (DFT), filter design, and filter structure. This course also exposes students to computational tools in solving engineering problems related to DSP and its applications.

**BHE4212 Digital Signal Processor****Credit: 2****Pre-Requisite: None****Synopsis**

This course exposes students with knowledge criteria for selection Digital Signal Processor (DSP), architecture and assembler of a floating-point processor, programming in C with the integrated development environment, connection to the environment: A/D converter and serial interface, interrupt programming and timers, concept of block processing and DMA, real-time operating system, structuring of methods for digital signal processing with regard to real-time implementation and development and implementation on a DSP of a digital project signal processing.

**BHE4714 Team Oriented Project Study****Credit: 4****Pre-Requisite: None****Synopsis**

This course introduces, educate, and develop students to integrate their technical knowledge and generic skills gained in their first two years of study. It consists of knowledge and flow of a design project from sketching, design in necessary software. The translation of the idea into a professional drawing is also covered in this course. In the end of sessions, students are expected to be able to identify the complex problem to be solved, plan the solution for the problem and eventually execute the project. The course includes

complex electrical and electronics engineering problems and proposal of design systems, components or processes that integrate core areas. Students will be divided into small groups of three or four members to conduct project that integrates multi-disciplinary areas. Students are required to produce product which considers environmental safety and sustainability.

**BHE4735 Bachelor Thesis****Credit: 5****Pre-Requisite: BHE1123, BHE1213, BHE2213, BHE1313, BHE3223****Synopsis**

This course aims to train students to utilise their engineering knowledge and technical skills to solve an engineering problem. For this reason, the use of projects as a transport for teaching and for integration of subject area is strongly encouraged throughout the programme. Students should be capable of handling the problem independently with scientific and methodical in a given time.

**BHE4741 Final Thesis Examination****Credit: 1****Pre-Requisite: None****Synopsis**

This course will test the mastery of the basic principles and important facts in learning content of the automotive studies and the bachelor thesis via written viva session between UMP/Company supervisor as well as the HKA supervisor.

**BHE4313 Industrial Revolution 4.0****Credit: 3****Pre-Requisite: None****Synopsis**

This course teaches the student on the basics of a process control system by understand the mapping of continuous production processes in control systems, the integration process components in control systems, the combination process components into an

overall system to design and commission complex process automation systems. The students should be able to process analogue signals in digital systems by mastering the basics of signal sampling and signal processing. The student also can apply techniques for coupling real-time and non-real-time systems, while understanding methods of data analysis using artificial intelligence around the entire information chain from data acquisition to real-time processing.

### **BHE4533 Optoelectronics**

**Credit: 3**

**Pre-Requisite: None**

#### **Synopsis**

This course introduces the students to learn the basic theoretical and knowledge of optoelectronics and the measurement technology based on it. Topics include optical and optoelectronic components and their applications in sensory science. After completing the course, the students are qualified to manage the scientific fundamentals of optoelectronic components, analyze sensor systems, and select optimal beam sources and file sets with a view to optimizing the system properties. In addition, the student also able to solve optoelectronic problems in sensor technology and transmission technology independently, while evaluating systematic limits of optoelectronic sensor components and optical measurement techniques

## CURRICULUM STRUCTURE BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY (POWER & MACHINE) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
	BTU1113 Physics	BUM1223 Calculus	BTM2014 Manufacturing Computer Applications	BTM1614 Computer-Aided Design	BTM3343 Computer Integrated Manufacturing	BTE3253 Microprocessor and Interfacing	BTE4713 Programmable Logic Control	BTW4812 Industrial Training
	BTU1112 Physics Laboratory	BTE2133 Electrical Fundamentals and Circuit Analysis II	BUM2113 Applied Mathematics	BTE3223 Digital Logic Design	BUM2423 Applied Statistics	BTE3052 Microprocessor and Interfacing Lab	BTW4**3 Elective 1	
	BTU1213 Chemistry	BTE2132 Electrical Fundamentals and Circuit Analysis II Laboratory	BTE2413 Electrical Power System	BTE3232 Digital Logic Design Lab	BTE3243 Control System	BTW3113 Power System Analysis	BTW4**3 Elective II	
	BTU1212 Chemistry Lab	BTE2313 Computer Programming	BTE3143 Electrical Machine and Transformer	BTW2243 Advanced Electric Machines	BTE3242 Control System Lab	BTW3223 Electrical Installation Design	BTW4**3 Elective III	
<b>COURSES</b>	BUM1113 Technical Mathematics	UHC1012 Falsafah dan Isu Semasa	BTE3142 Electrical Machine and Transformer Laboratory	BTW2242 Advanced Electric Machines Laboratory	BTW3213 Power Electronic Drive Machine	BTW3222 Electrical Installation Design Lab	BTW4826 Engineering Technology Senior Design Project II	
	BTE2123 Electrical Fundamentals and Circuit Analysis I	UHC2022 Penghayatan Etika dan Peradaban	UHL2422 English For Technical Communication	UHL2432 English for Professional Communication	BTW3212 Power Electronic Drive Machine Laboratory	BTW3313 Power System Protection & High Voltage		
	BTE2122 Electrical Fundamentals and Circuit Analysis I Laboratory	UHS1022 Soft-Skills	UGE2002 Technopreneurship	UHF11*1 Foreign Language I	BTW3632 Maintenance Technology	BTW3813 Engineering Technology Senior Design Project I		
	UHL2400 Fundamentals of English Language	UHL2412 English for Academic Communication		UQA2002 Co-curriculum	UHF21*1 Foreign Language II			
<b>TOTAL CREDIT PER SEMESTER</b>	<b>18</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>18</b>	<b>12</b>
<b>OVERALL TOTAL CREDIT FOR GRADUATION</b>	<b>143</b>							

**ELECTIVE COURSES FOR  
BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY (POWER & MACHINE) WITH  
HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BTW4713	Power System Operation & Control	3
2	BTW4723	Power Quality	3
3	BTW4733	Alternative Energy	3
4	BTE4733	Sensor Technology	3
5	BTS4723	Software Engineering	3
6	MEE3213	Power Electronics Design	3
7	MEE3313	Photovoltaic System Design	3
8	MEE3323	Energy Storage	3
9	MEE3333	Wind Energy System	3
<b>Total minimum credits of elective courses for graduation</b>			<b>9</b>

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	To produce engineering technologists with mastery of the needed expertise in industries using the foundation of technology and innovation.
PEO2	To prepare engineering technologists that demonstrate skills of lifelong learning for professional and personal development.
PEO3	To prepare engineering technologists with good management skill, good professional ethics and understanding local law in energy and environmental issues.
PEO4	To prepare global engineering technologists that work and communicate effectively in multinational and multidisciplinary engineering community.

PROGRAMME OUTCOMES (PO)	
PO1	Apply knowledge of mathematics, science, engineering fundamentals and engineering technology principles to define and applied engineering technology procedures, processes, systems or methodologies.
PO2	Solve broadly-defined engineering technology problems systematically to reach substantiated conclusions by using appropriate tools and techniques appropriate to their discipline or area of specialisation.
PO3	Design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Plan and conduct experimental investigations of broadly-defined engineering technology problems by using data from relevant sources.
PO5	Select and apply appropriate techniques, resources and modern engineering technology tools, with an understanding of their limitations.
PO6	Function effectively as individuals, and as members or leaders in diverse technical teams.
PO7	Communicate effectively with the technical community and society at large.
PO8	Demonstrate an awareness of and consideration for societal, health, safety, legal

	and cultural issues and their consequent responsibilities.
PO9	Demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO10	Demonstrate an awareness of management, business practices and entrepreneurship.
PO11	Demonstrate an understanding of the impact of technical practices, taking into account the need for sustainable development.
PO12	Recognize the need for professional development and to engage in independent and lifelong learning.

## COURSE SYNOPSIS

### BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY (POWER & MACHINE) WITH HONOURS

#### CORE FACULTY

BTU1112  
Physics Laboratory  
Credit: 2  
Prerequisites: None

#### Synopsis

This laboratory introduces the students with the application of physics concept in engineering devices such as Free Fall, Bernoulli's Law, Hydrostatic Pressure And Electric Field. The concepts of physics introduced related in mechanics or dynamics motion and basic concepts of electrical area. The students will learn how to run the experiment with referring the basic concepts of physics during the lab hours.

#### Course Outcome

CO 1 Understanding the basic concepts, theories and principles of physics in engineering application  
CO 2 Demonstrating skills in logical thinking in handling equipment.  
CO 3 Applying basic physics concepts to problem solving  
CO 4 Applying physics knowledge to personal decisions involving physical problems

BTU1113  
Physics  
Credit: 3  
Prerequisites: None

#### Synopsis

Introduction to the materials, techniques, and equipment of industrial manufacturing. Emphasis on laboratory demonstration and simulation activities such as machining,

welding, casting, and forming operations.  
Course Outcome

CO 1 Illustrate basic concepts, theories and principles of physics in engineering application  
CO 2 Investigate physics problem in statics, energy and fluid mechanics  
CO 3 Demonstrate physics concepts of electric and magnetism

BTU1212  
Chemistry Laboratory  
Credit: 2  
Prerequisites: None

#### Synopsis

In chemistry laboratory the students are responsible to conduct the basic physical, organic chemistry and analytical instrument experiments such as solubility & miscibility (1), chemical equilibrium (2), buffer and pH changes (3), calorimetry (4), gravimetric (5), Limiting reactant (6), Reaction rate (7), Extraction with solvent (8), UV-VIS spectrometer (9), and Melting Point (10). At the end of experiments, the students should be able to inculcate the critical thinking and able to work in safe working condition.

#### Course Outcome

CO1 Apply physical, organic & analytical chemistry theory in laboratory  
CO2 Apply the basic science and analytical chemistry knowledge in operation of analytical chemistry equipment.  
CO3 Able to demonstrate and operate each analytical equipment base on the theories applied in analytical chemistry  
CO4 Able to indicate any minor/major malfunction of equipment, incorrect step/ result & troubleshoot it

BTU1213  
Chemistry  
Credit: 2

Prerequisite: None

### Synopsis

Development of the fundamental principles and concepts of chemistry by lecture-demonstration, as well as the development of an appreciation of the nature of chemistry as a science. An historical development of the most important concepts and ideas. Methods and limitations of chemistry, its evolution and discussions of the problems currently being solved and created.

### Course Outcome

CO1 Apply the basic knowledge about physical, inorganic and analytical chemistry.

CO2 Relate chemical concept and principles while presenting a broad range of topic in a clear and concise manner.

CO3 Develop problem solving and critical thinking skills on general chemistry.

BUM1113

Technical Mathematics

Credit:3

Prerequisites: None

### Synopsis

This course introduces and discusses the fundamental of mathematics focusing on providing a solid theoretical foundation for further work. Student are exposed to complex number, functions and graphs, trigonometric functions, analytic geometry, polar coordinates, 3 dimensional spaces and vector. Appropriate software is used by students to implement some of these ideas in practice.

### Course Outcome

CO 1 Acquire fundamental principle of functions and trigonometric.

CO 2 Apply appropriate mathematics concepts to solve various problems.

BUM1223

Calculus

Credit:3

Prerequisites: None

### Synopsis

There are two primary branches of calculus: differential and integral. Therefore, students are expose to limits and continuity, differentiation, application of differentiation, integration, and application of integration.

### Course Outcome

CO 1 Acquire fundamental principles of differentiation and integration.

CO 2 Apply appropriate calculus concepts to solve various technological problems.

BUM2113

Applied Mathematics

Credit:3

Prerequisites: None

### Synopsis

This course introduces ordinary differential equations (analytically and numerically), Laplace transforms and Fourier series. Related applications are also discussed.

### Course Outcome

CO 1 Acquire fundamental principle of first and second order ordinary differential equations, Laplace transforms, numerical method to solve initial and boundary value problem and Fourier series.

CO 2 Analyse and solve various differential equations of first and second order differential equations, Laplace transforms, numerical method and find Fourier series for various periodic functions.

BUM2413



Applied Statistics  
Credit:3  
Prerequisites:None

#### Synopsis

This course discusses on statistical problem solving methodology and descriptive statistics; sampling distribution and confidence interval; hypothesis testing; analysis of variance (ANOVA); goodness-of-fit test and contingency tables; regression and correlation including simple and multiple linear regressions. Microsoft Excel software will be used in this oral course as a statistical package (other statistical packages are SPSS, R Language, S Plus, EViews and Minitab shall be used in this course).

#### Course Outcome

CO 1 Acquire fundamental principle of statistics.  
CO 2 Perform statistical analysis by using appropriate statistical theory and methodology.  
CO 3 Analyse real life to solve related problem in various disciplines.

BTE2313  
Computer Programming  
Credit: 3  
Prerequisites: None

#### Synopsis

This course aims to introduce the fundamental element and feasibilities of the computer programming to solve identified problems. The contents emphasis not only on the theoretical knowledge of programming but also the practical implementation in solving applications problem. Students will learn basic structure of computer programming including variables and data types, input and output instruction, statements, functions, arrays, string, pointers and files operations. Students will be taught on developing a program to solve general engineering

problems, mathematical equations as well as displaying the data via 2D and/or 3D graphs.

#### Course Outcome

CO 1 Distinguish the principles and concept of computer programming to solve problems with utilization of mathematics & sciences knowledge.  
CO 2 Demonstrate the usage of programming techniques using high level programming language in solving problems.  
CO 3 Apply numerical knowledge in programming in solving problems.  
CO4 Construct programming technique's solutions using appropriate digital tools and platform.

#### CORE PROGRAM

BTE2122  
Electrical Fundamentals and Circuit Analysis I Laboratory  
Credit:2  
Prerequisites: None

#### Synopsis

This course introduces the basic laboratory of DC and AC circuit analysis. The contents include Ohm's Law, Kirchhoff's Law, series and parallel circuits, Mesh and Nodal analysis, superposition theorem, Thevenin and Norton equivalent of a complex circuit. The student will be handling measuring of capacitance, measure capacitor charge and discharge times, RL, RC circuits, phase difference, measure power in various type of circuits.

#### Course Outcome

CO 1 Construct various electrical circuits and properly use lab equipment to measure, analyse and troubleshoot the circuits  
CO 2 Solve the DC circuit problems using nodal analysis and mesh analysis, Thevenin and Norton equivalent and evaluate the most

efficient methods among them  
CO 3 Demonstrate the role of individual in team to achieve task completion.

BTE2123  
Electrical Fundamentals and Circuit Analysis I  
Credit:3  
Prerequisites: None

#### Synopsis

This course introduces the engineering methods of DC circuit analysis. The contents include Mesh and Nodal analysis, Source Transformation, and 4 main network Theorems: Superposition, Thevenin, Norton and Maximum Power Transfer theorems. It also includes the basic of DC transients in capacitors and inductors. Introduction to AC fundamentals and impedance concept of RLC circuits are also covered.

#### Course Outcome

CO 1 Analyse DC circuit problems using various methods of DC Analysis and Network Theorems  
CO 2 Apply Network Theorems to simplify and solve complex DC circuits.  
CO 3 Explain the effects of DC transients on capacitors and inductors.  
CO 4 Understand the AC circuit characteristics and show the ability to describe them effectively.  
CO 5 Describe R, L,C concepts in practical and relates them with the real industrial practice.

BTE2132  
Electrical Fundamentals and Circuit Analysis II Laboratory  
Credit:2  
Prerequisites: BTE2123, BTE2122

#### Synopsis

This course provides the basic concepts and engineering methods of AC circuits.

The contents include applications of Mesh and Nodal analysis, Superposition and Source Transformation Theorems, Thevenin and Norton Theorem. Resonant circuit, Filters, Bridges and Balanced 3-phase circuits are also covered.

#### Course Outcome

CO 1 Construct AC circuits and validate circuit analysis theorems.  
CO 2 Assemble schematic circuits in actual circuit and interpret the experimental results into report.  
CO 3 Work in a team and communicate effectively.

BTE2133  
Electrical Fundamentals and Circuit Analysis II  
Credit:3  
Prerequisites: BTE2123

#### Synopsis

This course provides the basic concepts and engineering methods of AC circuits. The contents include applications of Mesh and Nodal analysis, Superposition and Source Transformation Theorems, Thevenin and Norton Theorem. Resonant circuit, Filters, and Balanced 3-phase circuits are also covered.

#### Course Outcome

CO 1 Solve the basic AC parameters in simple AC Series-Parallel Circuits and resonant circuits.  
CO 2 Analyze AC circuits and magnetically couple circuit problems using theorems in AC circuits.  
CO 3 Define the power parameters, power factor correction and resonance parameters in AC circuits.  
CO 4 Analyze the frequency response on AC circuit using Bode Plot.  
CO 5 Demonstrate the role of individual in team to achieve task completion.

BTM1614  
Computer-Aided Design  
Credit:4  
Prerequisites: None

#### Synopsis

This course is a basic and advanced computer aided drafting in 2D. CAD tools required to document engineering designs. This subject is designed to introduce to the student the principle of computer-aided design including drafting, drawing, dimensioning, tolerances and commands.

#### Course Outcome

CO 1 Analyse technical drawing.  
CO 2 Apply basic geometric construction technique in creating 2D object and projecting 3D object in 2D space.  
CO 3 Perform working drawing with its components and follow the standards that apply.  
CO 4 Display geometric dimensioning and tolerancing in working drawing.

BTM2014 / BTM3234  
Manufacturing Computer Application  
Credit:4  
Prerequisites: BUM1113

#### Synopsis

bandwidth for series/ parallel resonant circuits. Overview of computer hardware, software, and processing concepts related to the control of manufacturing tasks. Emphasis on practical in computer programming to control devices in the solution of a variety of manufacturing problems. Students will be exposed to widely use programming language and its application in manufacturing.

#### Course Outcome

CO 1 Introduction to the hardware and software.  
CO 2 Explain the programming language of microcontroller  
CO 3 Demonstrate the advanced function

of Microcontroller  
CO 4 Develop manufacturing application software

BTE3142  
Electrical Machines and Transformers Laboratory  
Credit:2  
Prerequisites: BTE2133

#### Synopsis

This course introduces the fundamental concepts and principles of transformer and various types of electrical machines. It is intended for students to understand fundamental aspects of rotating electrical machines. The first part of the course is a quick review of some electromagnetism fundamental while the following will deal with the transformers and different types of electrical machines.

#### Course Outcome

CO 1 Displays the transformer and machines equivalent circuits and the operating conditions for electrical machines under steady state conditions.  
CO 2 Construct driver circuit for DC and AC motor.  
CO 3 Measure, determine and interpret the parameters of transformer and torque-speed characteristics of rotating machines.

BTE3143  
Electrical Machines and Transformers  
Credit:3  
Prerequisites: BTE2133

#### Synopsis

This course introduces the fundamental concepts and principles of transformer and various types of electrical machines. It is intended for students to understand fundamental aspects of rotating electrical machines. The first part of the course is a quick review of some electromagnetism

fundamental while the following will deal with the transformers and different types of electrical machines.

#### Course Outcome

CO 1 Analyze the transformer and machines equivalent circuits and the operating conditions for electrical machines under steady state conditions.

CO 2 Determine the parameters of transformer and characteristics of rotating machines.

CO 3 Determine the importance the parameters of electrical machines in industry in group

#### BTW3222

Electrical Installation Design Laboratory

Credit:2

Prerequisites: None

#### Synopsis

This course provides knowledge in electrical installation design especially for commercial buildings. It explores the basic estimation and design procedure based on various codes of practice and standards. Student will be introduced to design a few basic systems in electrical installation such as lighting, protection system, grounding and lightning protection. Students also involve in problem solving and troubleshooting technique when they study on system inspection and testing.

#### Course Outcome

CO 1 Describes the different types of electrical installation application available.

CO 2 Construct electrical installation using suitable wiring tools and accessories as accordance to Standard.

CO 3 Design the different types of professional industrial wiring of electrical installation.

#### BTW3223

#### Electrical Installation Design

Credit:3

Prerequisites: None

#### Synopsis

This course provides knowledge in electrical installation design especially for commercial buildings. It explores the basic estimation and design procedure based on various codes of practice and standards. Student will be introduced to design a few basic systems in electrical installation such as lighting, protection system, grounding and lightning protection. Students also involve in problem solving and troubleshooting technique when they study on system inspection and testing.

#### Course Outcome

CO 1 Attribute the lighting layout and power layout using AutoCAD software.

CO 2 Estimate electrical load for an installation and design single-line diagram for the installation.

CO 3 Explain the protection system used in electrical installation.

CO 4 Justify the importance of grounding system and lightning protection system.

CO 5 Measure and determine basic inspection and testing for building electrical installations

#### BTE3052

Microprocessor and Interfacing Laboratory

Credit:2

Prerequisites: BTE2313 & BTE3223

#### Synopsis

This course in an introduction to a microprocessor/microcontroller. Students are exposed to the internal architecture of the microprocessor/ microcontroller, various instruction sets, and basic hardware design of embedded system.

#### Course Outcome

CO 1 Explain the architecture of the

microprocessor/microcontroller system and its interface.

CO 2 Develop programs for applications in embedded systems using Assembly and C language.

CO 3 Work in a team and communicate effectively.

BTE3253

Microprocessor and Interfacing

Credit:3

Prerequisites: BTE2313 & BTE3223

Synopsis

This module is an introduction to a microprocessor/microcontroller. Students are exposed to the internal architecture of the microprocessor / microcontroller, various instruction sets, program developing for applications in embedded systems using C language and basic hardware design of embedded systems.

Course Outcome

CO 1 Illustrate the architecture of the microprocessor/microcontroller system and develop programs for applications in embedded system using assembly language.

CO 2 Develop basic programs for applications in embedded systems using "c" language.

CO 3 Develop advance programs for applications in embedded systems using "C" language.

CO 4 Work in a team and communicate effectively.

BTE3222

Digital Logic Design Laboratory

Credit:2

Prerequisites: None

Synopsis

This course covers the laboratory experiments on digital circuits design and verification, using various digital circuit

components. Combinational design techniques as well as sequential design techniques are presented with the use of Karnaugh mapping, state transition diagrams and tables are also included in the course.

Course Outcome

CO 1 Apply various techniques for digital logic simplification and use various basic digital circuits like flip flops, counter and shift register.

CO 2 Analyse logic system, counter, decoder, memory devices and multiplexer.

CO 3 Work in a team and communicate effectively.

BTE3223

Digital Logic Design

Credit:3

Prerequisites: None

Synopsis

This course emphasizes on the fundamental of digital electronics. The student is first taught about the number system and logic gates before introducing them to digital IC. Then they are exposed to both combinational logic network and combinational Medium Scale Integrated (MSI) logic. In concurrence with this, the fundamental of sequential logic, flip-flop, counter and shift register are taught.

Course Outcome

CO 1 Describe in details the principles of digital logic systems.

CO 2 Analyze combintional logic system for Medium Scale Integrated (MSI) logic design.

CO 3 Analyze and design sequential logic system for counters and registers.

CO4 Construct digital logic circuit.

CO5 Work in a team and/or as a leader to accomplish given task.

BTE2413

**Electrical Power System**

Credit:3

Prerequisites: BTE2133

**Synopsis**

This course introduces the fundamentals of essential elements of electrical power systems. The students will be exposed to electric power generation, transmission, distribution and basic power system design. It also includes operation concepts of switchgear, sub-station, and power systems protection techniques. In concurrence with this, the fundamental of power system analysis will be introduced.

**Course Outcome**

CO 1 Understand the concept of electrical power system, power generation and power transmission system as well as the functions of respective system/facility (switchgear, protection and sub-station).

CO 2 Carry out the performance analysis for different classification of transmission lines and power distribution systems.

CO 3 Analyse characteristics parameters and evaluate the performance of power system elements using suitable softwares/tools.

CO 4 Demonstrate the communication ability towards task completion.

**BTE3242**

Control System Laboratory

Credit:2

Prerequisites: BUM2113 &amp; BTE2233

**Synopsis**

This course introduces students to the control system technology, mathematical models of feedback systems. The students will be exposed to transient and steady-state analysis, root locus, frequency response and PID Response.

**Course Outcome**

CO 1 Construct mathematical models of a Control Systems' Components using Computer aided tools (Modern Tool Usage)

CO 2 Validate the theoretical calculation for Controls Systems Responses using Modern tools (example: PID Controller)

CO 3 Propose relevant information on control systems engineering technology by referring various information sources

This course emphasizes on the fundamental of BTE3243

Control System

Credit:3

Prerequisites: BUM2113 &amp; BTE2233

**Synopsis**

This course introduces students to the control system technology, mathematical models of feedback systems. The students will be exposed to the transient and steady-state analysis, root locus, frequency response and analysis design of compensator

**Course Outcome**

CO 1 Apply the fundamental concept and theories of control systems and formulate the transfer function of electrical and mechanical systems

CO 2 Analyse the signal flow graph and determine the stability and steady-state errors of control system.

CO 3 Solve control system problems by utilizing bode plot method.

CO 4 Design the compensation technique that can be used to stabilize control systems.

**BTW3632**

Maintenance Technology

Credit:2

Prerequisites: None

**Synopsis**

This course introduces students to the vast maintenance strategies and technologies in maintenance practices adoption. The

course will cover the skills for implementing an effective maintenance program through workplace environment simulation such as effective work culture, costs appreciation, workplace safety and workplace productivity.

#### Course Outcome

- CO 1 Classify the types of maintenance strategies and tools utilized in industry.
- CO 2 Solve LCC and inventory cost based on various problems.
- CO 3 Explain the important role of safety practices for the environment.
- CO 4 Report maintenance performance using appropriate method.
- CO 5 Determine appropriate and effective action during plant shutdown

BTW2242

Advance Electric Machine Laboratory

Credit:2

Prerequisites: BTE3143

#### Synopsis

This course is a continuation of BTE 3143 where it will focus more on understanding the principles and analysis of electromechanical systems. It is intended for students to understand fundamental aspects of AC electrical machines.

#### Course Outcome

- CO 1 Construct the models of transformer and permanent magnet synchronous machine using MATLAB Simulink
- CO 2 Evaluate and observe the induction machines characteristics
- CO 3 Measure, determine and interpret the parameters and justify the importance of AC machines in industries

BTW2243

Advance Electric Machine

Credit:3

Prerequisites: BTE3143

#### Synopsis

This course is a continuation of BTE 3143 where it will focus more on various types of A.C electrical machines. It is intended for students to understand fundamental aspects of A.C electrical machines. The course is dealing with transformers and different types of A.C electrical machines.

#### Course Outcome

- CO 1 Attribute the basic principles of selected A.C electrical machines,
- CO 2 Analyze the transformer and machines equivalent circuits and the operating conditions for DC and AC electrical machines
- CO 3 Provide solution to a technical problem on transformer and AC electrical machines
- CO 4 Measure, determine and interpret the parameters of transformer and torque-speed characteristics of AC electrical machines.
- CO 5 Justify the importance of AC electrical machines and impacts to the industry.

BTW3313

Power System Protection and High Voltage

Credit:3

Prerequisites: None

#### Synopsis

This course introduces students to the concept of power system protection and high voltage engineering. It covers in detail the components of power system protections and relay coordination. The theory of high voltage engineering will also be covered in this course.

#### Course Outcome

- CO 1 Describe the components of power system protection.
- CO 2 Recognize the various type of circuit breaker.

- CO 3 Design the relay setting of IDMT and distance protection.
- CO 4 Explain the concepts of high voltage engineering
- CO 5 Work effectively in team.

BTW3113  
Power System Analysis  
Credit:3  
Prerequisites: None

#### Synopsis

This course introduces students to the fundamental concepts of power system analysis which covered the power flow problem analysis, balanced and unbalanced fault analysis and stability evaluation. Students will be exposed to the problems commonly encountered in power system engineering practice, analysis and techniques applied to solve some practical problems in power systems.

#### Course Outcome

- CO 1 Analyze the power flow equations for an n-bus power system,
- CO 2 Analyze balance and unbalance fault analysis.
- CO 3 Evaluate the performance of power system stability.
- CO 4 Analyze model of power system network under steady state and faults conditions using power system software.
- CO 5 Work in team effectively.

BTW3212  
Power Electronic Drive Machine Laboratory  
Credit:2  
Prerequisites: None

#### Synopsis

The primary objective of the course is to give students a foundation of knowledge, understanding, analysis and design of power electronics circuits for conversion and control of electrical energy. The course

presents concepts, fundamentals analysis tools, practical consideration for design, and a range of power electronics applications. Practical experiments in the laboratory will also be conducted. Students will be exposed to the power converter, PWM switching techniques, DC and induction motor drives.

#### Course Outcome

- CO 1 Work with different types of power electronic converters,
- CO 2 Measure and interpret the parameters of inverter circuits,
- CO 3 Design and implement complete electric vehicle using electric drivers.

BTW3213  
Power Electronic Drive Machine  
Credit:3  
Prerequisites: None

#### Synopsis

The primary objective of the course is to give students a foundation of knowledge, understanding, analysis and design of power electronics circuits for conversion and control of electrical energy. The course presents concepts, fundamentals analysis tools, practical CO 5 consideration for design, and a range of power electronics applications. Practical experiments in the laboratory will also be conducted. Students will be exposed to the power converter, PWM switching techniques, DC and induction motor drives.

#### Course Outcome

- CO 1 Explain the impact of power electronics technology in societal and environmental context
- CO 2 Analyze switching characteristics of basic solid state power devices, operating principles, advantages and disadvantages of basic power electronics converter topologies
- CO 3 Investigate power electronics converter topology in continuous



conduction mode (CCM) or discontinuous conduction mode (DCM)

CO 4 Analyze electrical drive fundamentals and the load characteristics

CO 5 Work effectively in team

BTW3813

Engineering Technology Senior Design I

Credit:3

Prerequisites: None

### Synopsis

This course is designed to expose the students to a senior design project. They have to apply all the knowledge that they have learned in the programme to complete the senior design project. Each student will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor). During the senior design project I, the students will be able to do a literature survey and prepare a draft which contains objective of the project, problem statement, literature survey, solving techniques, methodology, expected result, treatment of results and list of reference publications. At the end of this subject, the students are required to present the draft in a short seminar which will be evaluated by a faculty's panel.

### Course Outcome

CO 1 Apply related engineering technology knowledge in order to provide solution to practice-oriented, industrial-based and/or research-based problem

CO 2 Investigate the problem background of engineering technology task and propose a suitable solution to the problem.

CO 3 Implement the engineering technology tools using related software and hardware to assist the project development.

CO4 Illustrate the understanding on engineering technologist responsibility towards the society and community.

CO5 Organize the project development according to the project planning and

schedule in a timely manner.

CO6 Report the technical content of the project accordingly and carry out literature review to understand the project requirement.

BTM3514

Computer Integrated Manufacturing

Credit:4

Prerequisites: None

### Synopsis

This course intends to apply the knowledge of computer integrated manufacturing systems utilized by industry, including automated flow line, material handling system, system control, programmable logic control, robotics, computer-aided manufacturing, computer-aided design/drafting, computer-aided testing/inspection, and computer-aided process planning. At the end of this course the students will have sound knowledge of how each of these areas interact with production and business in a competitive world.

### Course Outcome

CO 1 Describe importance of automation in industry and key elements of computer integrated manufacturing system

CO 2 Analyze manufacturing operations that can combine with various elements of computer integrated manufacturing

CO 3 Adapt manufacturing system and manual labor process prior to create and propose their own customized CIM system

BTW4826

Engineering Technology Senior Design Project II

Credit:6

Prerequisites: BTW3813

### Synopsis

This course is designed to expose the students to a senior design project. They

have to apply all the knowledge that they have learned in the program to complete the senior design project. Each student will be supervised by at least one lecturer. During the senior design project I, the students will be able to do a literature survey and prepare a draft which contains objective of the project, problem statement, literature survey, solving techniques, methodology, and expected result and list of reference publications. At the end of this subject, the students are required to present the proposal draft in a short seminar which will be evaluated by a faculty's panel.

#### Course Outcome

CO 1 Analyze the outcome of the project development based on the project objectives as well as benchmark with related standard.

CO 2 Design and develop the engineering technology project to solve the objectives of the practice-oriented, industrial-based and/or research-based problem.

CO 3 Utilize the engineering technology tools using related software and hardware to assist the project development

CO 4 Illustrate the ethical awareness and professionalism in providing the solution of the engineering technology project.

CO5 Consider the impact of the engineering technology project that is being designed from the societal and environmental point of view

CO6 Report the technical content of the project accordingly and carry out literature review to understand the project requirement.

BTW4812

Industrial Training

Credit:12

Prerequisites: All Subject

#### Synopsis

In Industrial Training the students should gain insight into industrial practice, in order

to visualize the tasks and possibilities of their later occupation work. All students are required to undergo an industrial training for a certain period that has been agreed by the faculty during last semester of the academic year. The performance of each student during the periods of his/her industrial training is evaluated by the faculty staff, and the representatives from employer organization.

#### Course Outcome

CO 1 Initiate effort to apply acquired technical skill for problem solving in the industry.

CO 2 Function as a professional and ethical trainee in an organization during the industrial training.

CO 3 Demonstrate a professional commitment and responsibilities at workplace.

CO 4 Present the outcomes of industrial training in a formal oral and report writing presentation.

CO 5 Conduct an analysis on one main issue discovered during industrial training.

BTE4713

Programmable Logic Controller

Credit:3

Prerequisites:

#### Synopsis

In this course, basic concepts and skills needed to install, program, and apply programmable electronic controllers in industry. Discrete and analog input/output (I/O) devices and ladder logic will be studied, including basic and intermediate PLC functions. Experiments in operation, programming, and industrial applications with emphasis on discrete I/Os.

#### Course Outcome

CO 1 Analyze the functions of hardware component of programmable logic controllers and PLC programming

Co 2 Design proficiency in ladder logic by

applying programming skills to implement industrial applications

CO 3 Varies a program to operate the manufacturing application

CO 4 Display problems in industrial applications requiring PLCs by troubleshooting hardware and software

### ELECTIVE COURSES

BTW4713

Power System Operation & Control

Credit:3

Prerequisites:

#### Synopsis

This course discusses the fundamental concept of power system operation control. Students will learn in detail the basic of power system management to ensure that load demand can be met at optimal operating cost. Students will also learn the various methods that can be done to control electrical power.

#### Course Outcome

CO 1 Analyze the properties involved in planning of electrical power in industry

CO 2 Differentiate and analyze control methods in power.

CO 3 Model and analyze power system network under steady state conditions

CO 4 Measure and organize data from power system control laboratories

CO 5 Work in team and communicate effectively

BTW4723

Power Quality

Credit:3

Prerequisites:

#### Synopsis

This module will introduce students to the structural and functional principles of sensors used for various physical and derived quantities and how to use them to

measure these quantities.

#### Course Outcome

CO 1 Explain the nature, causes and effects of power quality issues; sag, swell, transient, harmonics, interruptions, voltage variations and power factor.

CO 2 Analysis the severity of power quality problems and propose suitable method of mitigating the problem with reflect to cost,

#### Course Outcome

CO 1 Analyze the principles and operation of how different sensors work

CO 2 Evaluate different type of sensors and modalities are appropriate for different applications

CO 3 Conduct various measurements using different types of sensors

BTW4733

Alternative Energy

Credit:3

Prerequisites:

#### Synopsis

This course introduces students to theories of alternative energies and energy usage in electric power system industry. It goes over energy conversion, usage and storage of renewable energy technologies (wind, solar, wave, fuel cell and biomass). This course focuses on technological development of photovoltaic (PV) systems. It also covers the basic of environmental effect of applying alternative energy technology specifically to global climate change and pollution

#### Course Outcome

CO 1 Describe the properties (source, pros, cons) of available alternative energy today

CO 2 Measure and calculate the best design properties of PV systems

CO 3 Analyze solar and wind resources and components of PV and wind turbine system

CO 4 Interpret the various design of renewable systems and generate useful data

CO 5 Explain the effects of alternative energy to the environment

## CURRICULUM STRUCTURE BACHELOR OF ELECTRONICS ENGINEERING TECHNOLOGY (COMPUTER SYSTEM) WITH HONOURS

YEAR SEMESTER	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
	BTU1113 Physics	BUM1223 Calculus	BUM2113 Applied Mathematics	BTE3223 Digital Logic Design	BTE3233 Communication System Design	BTS3133 Signals & Networks	BTS4164 Robotics	BTS4812 Industrial Training
	BTU1112 Physics Laboratory	BTM1614 Computer Aided Drafting	BTE2213 Electronic I	BTE3222 Digital Logic Design Laboratory	BTE3232 Communication System Design Laboratory	BTS3132 Signals & Networks Laboratory	BTS4**3 Elective I	
	BTU1213 Chemistry	BTE2133 Electrical Fundamentals & Circuit Analysis II	BTE3212 Electronic I Laboratory	BTE3243 Electronic II	BTE3053 Microprocessor and Interfacing	BTS3143 Microcontroller & Embedded Systems	BTS4**3 Elective II	
	BTU1212 Chemistry Laboratory	BTE2132 Electrical Fundamentals & Circuit Analysis II Laboratory	BTE2313 Computer Programming	BTE3242 Electronic II Laboratory	BTE3252 Microprocessor and Interfacing Laboratory	BTS3142 Microcontroller & Embedded Systems Laboratory	BTS4**3 Elective III	
COURSES	BUM1113 Technical Mathematics	UHC1012 Falsafah Dan Isu Semasa	UHC2022 Penghayatan Etika Dan Peradaban	BTS4253 Computer Vision System	BTS3113 Numerical & Control Systems	BTS3153 PLC Basics and Applications	BTS4826 Engineering Technology Senior Design Project II	
	BTE2123 Electrical Fundamentals & Circuit Analysis I	UHS1022 Soft-Skills	UHL2422 English for Technical Communication	UHL2432 English for Professional Communication	BTS3112 Numerical & Control Systems Laboratory	BTS3152 PLC Basics and Applications Laboratory		
	BTE2122 Electrical Fundamentals & Circuit Analysis I Laboratory	UHL2412 English for Academic Communication	UHF11*1 Foreign Language I	UHF21*1 Foreign Language II	BTS3123 Computer Architecture	BTS3813 Engineering Technology Senior Design Project I		
	UHL2400 Fundamentals of English Language		UQA2002 Co-Curriculum	UGE2002 Technopreneurship	BTS3122 Computer Architecture Laboratory			
TOTAL CREDIT PER SEMESTER	17	18	18	18	20	19	19	12
OVERALL TOTAL CREDIT FOR GRADUATION	141							

**ELECTIVE COURSES FOR  
BACHELOR OF ELECTRONICS ENGINEERING TECHNOLOGY (COMPUTER SYSTEM) WITH  
HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BTS4713	Advanced Microprocessor	3
2	BTS4723	Software Engineering	3
3	BTS4733	Internet Programming	3
4	BTE4723	Advanced Electronics Circuits	3
5	BTE4733	Sensors Technology	3
6	BTE4743	Power Electronics	3
7	MEE3213	Power Electronics Design	3
8	MEE3313	Photovoltaic System Design	3
9	MEE3323	Energy Storage	3
10	MEE3333	Wind Energy System	3
<b>TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION</b>			<b>9</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	To successfully practice digital electronics, communication systems, signal processing, control systems, system integration, and computer-based systems to serve government agencies, national and international industries
PEO2	To critically evaluate, design and apply alternate assumptions, approaches, procedures, of electronic and/or computer-based components and systems for applications including signal processing, communications, and control systems
PEO3	To successfully demonstrate good leadership qualities, teamworking spirit, communication skills, ethical values and social responsibilities to fulfill their duties towards the working culture and community.
PEO4	To engage in lifelong learning and new knowledge development in Engineering Technology (Computer Systems).

**PROGRAMME OUTCOMES (PO)**

PO1	Apply knowledge of mathematics, science, engineering fundamentals and engineering technology principles to define and applied engineering technology procedures, processes, systems or methodologies.
PO2	Solve broadly-defined engineering technology problems systematically to reach substantiated conclusions by using appropriate tools and techniques appropriate to their discipline or area of specialisation.
PO3	Design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Plan and conduct experimental investigations of broadly-defined engineering technology problems by using data from relevant sources.
PO5	Select and apply appropriate techniques, resources and modern engineering technology tools, with an understanding of their limitations.

PO6	Function effectively as individuals, and as members or leaders in diverse technical teams.
PO7	Communicate effectively with the technical community and society at large.
PO8	Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
PO9	Demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO10	Demonstrate an awareness of management, business practices and entrepreneurship.
PO11	Demonstrate an understanding of the impact of technical practices, taking into account the need for sustainable development.
PO12	Recognize the need for professional development and to engage in independent and lifelong learning

## **BACHELOR OF ELECTRONICS ENGINEERING TECHNOLOGY (COMPUTER SYSTEM) WITH HONOURS**

### CORE FACULTY

BTU1112  
Physics Laboratory  
Credit: 2  
Prerequisites: None

#### Synopsis

This laboratory introduces the students with the application of physics concept in engineering devices such as Free Fall, Bernoulli's Law, Hydrostatic Pressure And Electric Field. The concepts of physics introduced related in mechanics or dynamics motion and basic concepts of electrical area. The students will learn how to run the experiment with referring the basic concepts of physics during the lab hours.

#### Course Outcome

CO 1 Understanding the basic concepts, theories and principles of physics in engineering application  
CO 2 Demonstrating skills in logical thinking in handling equipment.  
CO 3 Applying basic physics concepts to problem solving  
CO 4 Applying physics knowledge to personal decisions involving physical problems

BTU1113  
Physics  
Credit: 3  
Prerequisites: None

#### Synopsis

This course introduces a fundamental of physics. It covers unit and measurements, kinematics, forces and Newton's law of motion, statics equilibrium, work, energy and power, fluid mechanics, electric and magnetism

#### Course Outcome

CO 1 Understand the basic concepts, theories and principles of physics in engineering application  
CO 2 Solve physics problems such as in kinematics, forces and static equilibrium  
CO 3 Discuss physics quantity such as work, energy and power in a team  
CO 4 Applying basic laws to solve fluid, electrical and magnetism problems

BTU1212  
Chemistry Laboratory  
Credit: 2  
Prerequisites: None

#### Synopsis

In chemistry laboratory the students are responsible to conduct the basic physical, organic chemistry and analytical instrument experiments such as solubility & miscibility (1), chemical equilibrium (2), buffer and pH changes (3), calorimetry (4), gravimetric (5), Limiting reactant (6), Reaction rate (7), Extraction with solvent (8), UV-VIS spectrometer (9), and Melting Point (10). At the end of experiments, the students should be able to inculcate the critical thinking and able to work in safe working condition.

#### Course Outcome

CO1 Apply physical, organic & analytical chemistry theory in laboratory  
CO2 Apply the basic science and analytical chemistry knowledge in operation of analytical chemistry equipment.  
CO3 Able to demonstrate and operate each analytical equipment base on the theories applied in analytical chemistry  
CO4 Able to indicate any minor/major malfunction of equipment, incorrect step/ result & troubleshoot it

BTU1213  
Chemistry  
Credit: 3  
Prerequisite: None

#### Synopsis



Development of the fundamental principles and concepts of chemistry by lecture-demonstration, as well as the development of an appreciation of the nature of chemistry as a science. An historical development of the most important concepts and ideas. Methods and limitations of chemistry, its evolution and discussions of the problems currently being solved and created.

#### Course Outcome

CO1 Apply the basic knowledge about physical, inorganic and analytical chemistry.  
 CO2 Relate chemical concept and principles while presenting a broad range of topic in a clear and concise manner.  
 CO3 Develop problem solving and critical thinking skills on general chemistry.

BUM1113  
 Technical Mathematics  
 Credit:3  
 Prerequisites: None

#### Synopsis

This course introduces and discusses the fundamental of mathematics focusing on providing a solid theoretical foundation for further work. Students are exposed to complex number, functions and graphs, trigonometric functions, analytic geometry, polar coordinates, 3 dimensional spaces and vector. Appropriate software is used by students to implement some of these ideas in practice.

#### Course Outcome

CO 1 Apply appropriate mathematics concepts to solve various technological problems.  
 CO 2 Use appropriate software and tool to solve the graphical and computational problems in mathematics  
 CO 3 Analyze and think critically a wide range of problem and solve it using ideas and methods in calculus.  
 CO 4 Relate and applied the concepts and methods studied into other courses.

BUM1223  
 Calculus  
 Credit:3  
 Prerequisites: None

#### Synopsis

This course discusses Differentiation and applications, techniques of integration and applications, numerical integration and Taylor polynomial, Taylor Series & Maclaurin Series.

#### Course Outcome

CO 1 Understand the fundamental concepts of the calculus and connect them with the real world problem.  
 CO 2 Solve any related problem involving differentiation and integration.  
 CO 3 Apply the concepts and methods studied into other related courses.  
 CO 4 Communicate effectively in written and oral form through group discussion.  
 CO 5 Attain computational facility in differential and integral calculus.

BUM2113  
 Applied Mathematics  
 Credit:3  
 Prerequisites: None

#### Synopsis

This course introduces and discusses Partial Derivatives, Double Integrals, First Order Differential equations and Second Order differential equations.

#### Course Outcome

CO 1 Analyze and apply the knowledge of Multiple Integrations to solve various science and engineering problems.  
 CO 2 Analyze and solve various differential equation problems by using the basic principles and methodologies of First Order differential equations and Second Order differential.  
 CO 3 Apply the concepts and methods studied into other related courses.  
 CO 4 Communicate effectively in written and oral form through group discussion.

CORE PROGRAM

BTE2122  
Electrical Fundamentals and Circuit Analysis I  
Laboratory  
Credit: 2  
Prerequisites: None

## Synopsis

This course introduces the basic laboratory of DC and AC circuit analysis. The contents include Ohm's Law, Kirchhoff's Law, series and parallel circuits, Mesh and Nodal analysis, superposition theorem, Thevenin and Norton equivalent of a complex circuit. The student will be handling measuring of capacitance, measure capacitor charge and discharge times, RL, RC circuits, phase difference, measure power in various type of circuits.

## Course Outcome

CO 1 Construct various electrical circuits and properly use lab equipment to measure, analyse and troubleshoot the circuits. [PO5]  
CO 2 Solve the DC circuit problems using nodal analysis and mesh analysis, Thevenin and Norton equivalent and evaluate the most efficient methods among them. Also introduce the concept of AC [PO5]  
CO 3 Demonstrate the role of individual in team to achieve task completion [PO6]

BTE2123  
Electrical Fundamentals and Circuit Analysis I  
Credit: 3  
Prerequisites: None

## Synopsis

This course introduces the engineering methods of DC circuit analysis. The contents include Mesh and Nodal analysis, Source Transformation, and 4 main network Theorems: Superposition, Thevenin, Norton and Maximum Power Transfer theorems. It also includes the basic of DC transients in capacitors and inductors. Introduction to AC fundamentals and impedance concept of RLC circuits are also covered.

## Course Outcome

CO 1 Analyse DC circuit using various methods of DC Analysis.[PO2]  
CO 2 Apply Network Theorems to simplify and solve complex DC circuits.  
CO3 Explain the effects of DC transients on capacitors and inductors.  
CO4 Understand the AC circuit characteristics and show the ability to describe them effectively.  
CO5 Describe R, L,C concepts in practical and relates them with the real industrial practice.

BTE2132  
Electrical Fundamentals & Circuit Analysis II  
Laboratory  
Credit:2  
Prerequisites: BTE2123

## Synopsis

This course provides the basic concepts and engineering methods of AC circuits. The contents include applications of Mesh and Nodal analysis, Superposition and Source Transformation Theorems, Thevenin and Norton Theorem. Resonant circuit, Filters, Bridges and Balanced 3-phase circuits are also covered.

## Course Outcome

CO 1 Construct AC circuits and validate circuit analysis theorems.  
CO 2 Assemble schematic circuits in actual circuit and interpret the experimental results into report.  
CO 3 Work in a team and communicate effectively.

BTE2133  
Electrical Fundamentals & Circuit Analysis II  
Credit:3  
Prerequisites: BTE2123

## Synopsis

This course provides the basic concepts and engineering methods of AC circuits. The

contents include applications of Mesh and Nodal analysis, Superposition and Source Transformation Theorems, Thevenin and Norton Theorem. Resonant circuit, Filters, Bridges and Balanced 3-phase circuits are also covered.

#### Course Outcome

CO 1 Solve the basic AC parameters in simple AC Series-Parallel Circuits and resonant circuits.

CO 2 Analyze AC circuits and magnetically couple circuit problems using theorems in AC circuits.

CO 3 Define the power parameters, power factor correction and resonance parameters in AC circuits.

CO4 Analyze the frequency response on AC circuit using Bode Plot

CO5 Demonstrate the role of individual in team to achieve task completion.

BTE2313/BCI1103

Computer Programming

Credit: 3

Prerequisites: None

#### Synopsis

This course aims to introduce the fundamental element and feasibilities of the computer programming to solve identified problems. The contents emphasis not only on the theoretical knowledge of programming but also the practical implementation in solving applications problem. Students will learn basic structure of computer programming including variables and data types, input and output instruction, statements, functions, arrays, string, pointers and files operations. Students will be taught on developing a program to solve general engineering problems, mathematical equations as well as displaying the data via 2D and/or 3D graphs

#### Course Outcome

CO 1 Distinguish the principles and concept of computer programming to solve problems with utilization of mathematics & sciences knowledge.

CO 2 Demonstrate the usage of programming techniques using high level programming language in solving problems

CO 3 Apply numerical knowledge in programming in solving problems

CO4 Construct programming technique's solutions using appropriate digital tools and platform.

BTM1614

Computer-Aided Drafting

Credit:4

Prerequisites: None

#### Synopsis

Computer Aided Drafting is very important these days as a most effective design tools and is extensively required in industry. This course enables the students to learn about the technical drawing, applications of computer in design and manufacturing.

#### Course Outcome

CO 1 Analyse technical drawing.

CO 2 Apply basic geometric construction technique in creating 2D object and projecting 3D object in 2D space.

CO 3 Perform working drawing with its components and follow the standards that apply.

CO 4 Display geometric dimensioning and tolerancing in working drawing.

BTE3212

Electronics I Laboratory

Credit:2

Prerequisites: BTE2133

#### Synopsis

This course covers the laboratory / practical implementation related to diode characteristics, half-wave and full-wave rectifiers, Zener diode characteristic, Voltage regulator, BJT characteristics, BJT's Common Emitter Amplifier, MOSFET characteristics and MOSFET's Common Source Amplifier.

#### Course Outcome

CO 1 Measure electronics devices characteristics.

CO 2 Construct electric circuits and measure electronics parameters using diode and transistors.

CO 3 Build and simulate the operation of electric circuits in a team.

BTE2213

Electronics I

Credit:3

Prerequisites: BTE2133

Synopsis

The P-N Junction Diode, Diode Applications, Bipolar Junction Transistors (BJT), DC Biasing of the BJT Amplifier, Transistor Modelling, Cascade Amplifier, Small-Signal BJT Amplifier, Metal-Oxide-Semiconductor FET (MOSFET), MOSFET Amplifier, Frequency Response of BJT and FET Amplifiers.

Course Outcome

CO 1 Describe the working principle and functions of different types of diodes.

CO 2 Analyze different types of BJT in circuit configurations.

CO 3 Analyze different types of MOSFET in circuit configurations.

BTE3222

Digital Logic Design Laboratory

Credit:2

Prerequisites: None

Synopsis

This course covers the laboratory experiments on digital circuits design and verification, using various digital circuit components. Combinational design techniques as well as sequential design techniques are presented with the use of Karnaugh mapping, state transition diagrams and tables are also included in the course.

Course Outcome

CO 1 Apply various techniques for digital

logic simplification and use various basic digital circuits like flip flops, counter and shift register.

CO 2 Analyse logic system, counter, decoder, memory devices and multiplexer.

CO 3 Work in a team and communicate effectively.

BTE3223

Digital Logic Design

Credit:3

Prerequisites: None

Synopsis

This course emphasizes on the fundamental of digital electronics. The student is first taught about the number system and logic gates before introducing them to digital IC. Then they are exposed to both combinational logic network and combinational Medium Scale Integrated (MSI) logic. In concurrence with this, the fundamental of sequential logic, flip-flop, counter and shift register are taught.

Course Outcome

CO 1 Describe in details the principles of digital logic systems.

CO 2 Analyze combitional logic system for Medium Scale Integrated (MSI) logic design.

CO 3 Analyze and design sequential logic system for counters and registers

CO 4 Construct digital logic circuit.

CO 5 Work in a team and/or as a leader to accomplish given task.

BTE3242

Electronics II Laboratory

Credit:2

Prerequisites: BTE2213

Synopsis

This course covers the topics related to frequency response, multi-stage Amplifiers, differential amplifier characteristics with differential and common inputs. In addition, other topics included are ideal and non ideal Op-Amp characteristics, Inverting Amplifier and Non-inverting Amplifier, Operational Amplifier Circuits (i.e Comparator,

Summation, Subtractor, Integrator, Differentiator), as well as Active Low-Pass Filter, Active High-Pass Filter, Active Band-pass Filter, Active Band-Stop Filter.  
Course Outcome

- CO 1 Measure electronics devices characteristics.  
CO 2 Construct electric circuits and measure electronics parameters for different amplifier circuits.  
CO 3 Build and simulate the operation of electric circuit in groups.

BTE3243  
Electronics II  
Credit:3  
Prerequisites:BTE2213

#### Synopsis

This course covered the principle operation and application of power amplifier, differential amplifier and operational amplifier. The concept of digital to analog converter and analog to digital converter are also included in this course.

Course Outcome

- CO 1 Classify the working principle of different classes of power amplifier.  
CO 2 Distinguish the concept of configuration for electronics amplifiers and active filters using op-amps.  
CO 3 Evaluate the characteristics of different configurations of active filters using op-amps.  
CO4 Analyze the working principle of A/D and D/A Converters.

BTS4253  
Computer Vision System  
Credit:3  
Prerequisites: None

#### Synopsis

This course introduces students to the principles of Computer Vision which includes image formation and low level image processing, theory and techniques for extracting features from images, measuring

shape and location, and recognizing and classifying objects. Students will be exposed to design project using image processing software.  
Course Outcome

- CO 1 Explain the concept of computer vision and techniques in image enhancement.  
CO 2 Analyze and evaluate appropriate technique of image processing to solve engineering application.  
CO 3 Design and develop a vision system application using image processing software..  
CO 4 Conduct experiments and analysis of image processing problems and techniques.  
CO 5 Work effectively in a team to achieve common goal.

BTE3232  
Communication System Design Laboratory  
Credit:2  
Prerequisites: BTE2213

#### Synopsis

This course introduces theories in the area of communication systems. Topics covered include the basic elements of communications, signal analysis, amplitude modulation, frequency modulation, and single sideband modulation.

Course Outcome

- CO 1 Measure, determine, perform and interpret the parameter from various type of modulation and demodulation process.  
CO 2 Construct the various type of modulation and demodulation process.  
CO 3 Discuss the basic electronic communication system.

BTE3233  
Communication System Design  
Credit:3  
Prerequisites: BTE2213

#### Synopsis

This course introduces theories in the area of communication systems. Topics covered include the basic elements of

communications, signal analysis, amplitude modulation, angle modulations and digital modulations, as well as transmission channels and noise impact on the modulation system. Finally, some emergence of digital communication technologies are presented and compared.

#### Course Outcome

CO 1 Understand various types of modulation and demodulation techniques.

CO 2 Analyze related parameters to the transmitter and receiver using amplitude modulations in analog communication application.

CO 3 Solve related parameters to the transmitter and receiver using modulation in analog communication application

CO 4 Demonstrate the concept of communication system in the form of presentation / technical report writing

BTE3252

Microprocessor and Interfacing Laboratory

Credit:2

Prerequisites: BTE3223

#### Synopsis

This course is an introduction to a microprocessor/microcontroller. Students are exposed to the internal architecture of the microprocessor/ microcontroller, various instruction sets, and basic hardware design of embedded system.

#### Course Outcome

CO 1 Explain the architecture of the microprocessor/microcontroller system and its interface.

CO 2 Develop programs for applications in embedded systems using Assembly and C language.

CO 3 Work in a team and communicate effectively.

BTE3053

Microprocessor and Interfacing

Credit:3

Prerequisites: BTE3223

#### Synopsis

This module is an introduction to a microprocessor/microcontroller. Students are exposed to the internal architecture of the microprocessor / microcontroller, various instruction sets, program developing for applications in embedded systems using C language and basic hardware design of embedded systems.

#### Course Outcome

CO 1 Illustrate the architecture of the microprocessor / microcontroller system and develop programs for applications in embedded system using assembly language.

CO 2 Develop basic programs for applications in embedded systems using "C" language.

CO 3 Develop advance programs for applications in embedded systems using "C" language.

CO 4 Work in a team and communicate effectively.

BTS3112

Numerical & Control Systems Laboratory

Credit:2

Prerequisites: None

#### Synopsis

This laboratory is to introduce the students to numerical and control systems. Topics include Principle of CNC part programming, tooling and work-holding devices, machine tool position and motion control systems, automatic tool changers and machining centres, kinematics and mechanics of milling operations, part programming using CAD/CAM systems.

#### Course Outcome

CO 1 Write fundamental manual G-code programs, for various machining applications, including spindle speeds, and feed rates.

CO 2 Program absolute and incremental tool positions for machining canned cycle operations, linear and circular interpolation, looping and subroutine.

CO 3 Use a computer-based tool to prepare,

edit and print a machine readable part program and use a CNC machine to verify and machine a basic part

CO 4 Use 2D CAM software to create job operation files, 2D shape profiles, generate machine code, verify tool path using computer simulation, and machine basic parts on a CNC machine using computer generated code.

CO 5 Demonstrate the report writing skills in technical field and work in a team and communicate effectively.

BTE3113

Numerical & Control Systems

Credit:3

Prerequisites: None

#### Synopsis

This course is designed to introduce the students to numerical control systems. Topics includes Principle of CNC part programming, tooling and work-holding devices, machine tool position and motion control systems, automatic tool changers and machining centres, kinematics and mechanics of milling operations, part programming using CAD/CAM systems.

#### Course Outcome

CO 1 Write fundamental manual G-code programs, for various machining applications, including spindle speeds, and feed rates.

CO 2 Program absolute and incremental tool positions for machining canned cycle operations, linear and circular interpolation, looping and subroutine.

CO 3 Utilize computer-based tools to prepare, edit and print a machine readable part program and use a CNC machine to verify and machine a basic part.

CO 4 Use 2D CAM software to create job operation files, 2D shape profiles, generate machine code, verify tool path using computer simulation, and machine basic parts on a CNC machine using computer generated code.

BTS3122

Computer Architecture Laboratory

Credit:2

Prerequisites: None

#### Synopsis

In this lab course, student will be exposed to the knowledge of Computer arithmetic and ALU design, Data path and control to design and simulate the CPU, Pipelining, Memory hierarchy, caches and virtual memory, Interfacing CPU and peripherals, buses and Performance issues.

#### Course Outcome

CO 1 Design and emulate CPUs.

CO 2 Work in teams to design and implement CPUs.

CO 3 Write reports and make presentations of computer architecture projects.

BTS3123

Computer Architecture

Credit:3

Prerequisites: None

#### Synopsis

In this course, the architecture of the computer is explored by studying its various levels: physical level, operating-system level, conventional machine level and higher level. Students are supposed to understand computer arithmetic and ALE design, datapath and control, using Hardware Description Language to design and simulate the CPU, pipelining, memory hierarchy, caches and virtual memory, Interfacing CPU and peripherals, buses, multiprocessors, network of multiprocessors, parallel programming and computer networking is provided.

#### Course Outcome

CO 1 Understand the concept of computer architecture and it's basic hardware including the ALU, Processor, Register and Control Unit.

CO 2 Explain the concept of arithmetic operation and floating-point operation in a computer architecture

CO 3 Describe the criteria and requirement of computer hardware including the computer pipeline, memory and busses

CO 4 Analyze and explain the principles of operation of multiprocessor systems and its relation to the computer's performance issues.

BTS3132  
Signal & Networks Laboratory  
Credit:2  
Prerequisites: None

#### Synopsis

This course introduces the students to signals transformation machines and its application to electrical circuits. This includes applying Fourier Series, Fourier Transforms and Laplace Transform. The concept of frequency response is introduced in filter analysis and design with additional two port network techniques.

#### Course Outcome

CO 1 Distinguish the different type of signals and its operations.  
CO 2 Apply Fourier and Laplace techniques in solving electronics problems.  
CO 3 Analyze and differentiate several types of passive filters.  
CO 4 Evaluate various signals and systems using engineering software.  
CO 5 Conduct independent readings and research in designing Graphical User Interface (GUI) for any transformation technique.

BTS3133  
Signals & Networks  
Credit:3  
Prerequisites: None

#### Synopsis

This course introduces the students to various signals transformation techniques and its application to electrical circuits. This includes Fourier Series, Fourier Transforms and Laplace Transform. The concept of frequency response is introduced in filter analysis and design with additional two port network techniques.

#### Course Outcome

CO 1 Distinguish the different type of signals and its operations.  
CO 2 Apply Fourier and Laplace techniques in solving electronics problems.  
CO 3 Analyze and differentiate several types of passive filters.

BTS3142  
Microcontrollers & Embedded Systems Laboratory  
Credit:2  
Prerequisites: BTE3253

#### Synopsis

This laboratory is to understand the application of embedded systems. Students are exposed to the internal architecture of the advanced Microcontrollers using ARM Cortex M3, various instruction sets and hardware design of Microcontrollers-based. They will learn how to program the Microcontroller using Bare-Metal Embedded C programming technique.

#### Course Outcome

CO 1 Develop programs for applications in embedded systems using ARM Cortex M3 Microcontroller and Bare-Metal Embedded C programming technique.  
CO 2 Construct interface circuit for ARM Cortex-M3 Applications.  
CO 3 Work in a team and communicate effectively.

BTS3143  
Microcontrollers & Embedded Systems  
Credit:3  
Prerequisites: BTE3253

#### Synopsis

This course is designed to give the students a solid foundation in bare-metal firmware development for ARM-based microcontroller. The goal of this course is to teach students how to navigate the microcontroller reference manual and datasheet to extract the right information to professionally build peripheral



devices and firmware. To achieve this goal, no libraries are used, purely bare-metal embedded-c and register manipulations. By the end of this course, students will be able to configure microcontroller peripherals like GPIO, Display, Serial Communication and ADC.

Course Outcome

CO 1 Explain and identify the basic concept of ARM Cortex-M3 architecture.

CO 2 Design and develop program for application in Embedded System using Bare-Metal Embedded C Programming.

CO 3 Design and develop the interfacing procedure for Arm Cortex-M3 with Display devices, UART and Analog devices.

CO 4 Demonstrate the ability to used embedded programming technique and tools for solving embedded system problem.

BTS3152

PLC Basics and Applications Laboratory

Credit:2

Prerequisites: BTE3223

Synopsis

The student will learn on how to design the PLC Programming to control simple manufacturing applications. Students are also exposed to the analog input and output of the PLC card.

Course Outcome

CO 1 Construct the mathematical calculation which is involve addition, subtraction, multiplication, and division by using Ladder Programming.

CO 2 Demonstrate and discuss the function of discrete and analog card.

CO 3 Develop a program to operate the manufacturing applications.

BTS3153

PLC Basics and Applications

Credit:3

Prerequisites: BTE3223

Synopsis

This course covered the fundamental of Programmable Logic Controller (PLC) including input and output component, memory address, wiring diagram, troubleshooting and design of ladder diagram.  
Course Outcome

CO 1 Determine the principle, operation and function of PLC as well as its hardware and software configuration.

CO 2 Develop the ladder diagram using discrete/digital input for PLC application

CO 3 Develop the ladder diagram using analog input for PLC application

CO4 Build a project for PLC application and demonstrate the report writing skills in technical field

BTS4164

Robotics

Credit:4

Prerequisites: None

Synopsis

This course introduces an understanding of the principles of operation of automated equipment with particular reference to the industrial robot. This course covers classification and various types of robots and its application, robot kinematics, differential kinematics, robot dynamics, robot path planning and robot sensing.

Course Outcome

CO 1 Understand robotics and sensing system, its basic components and applications.

CO 2 Design workcell based on industrial problem.

CO 3 Analyze robot kinematics and dynamic.

CO 4 Function effectively as an individual and in a group to complete given task.

CO 5 Apply techniques and skills of robot manipulation through laboratory work.

BTS3813

Engineering Technology Senior Design Project I

Credit:3

Prerequisites: None

### Synopsis

This subject is the continuation of the subject Engineering Technology Senior Design Project I. In this course, the students are required to conduct the research, collect and analyze data, discuss the findings and form the conclusions. At the end of the semester, the students are required to produce a design project report and present it to faculty's evaluation panel.

### Course Outcome

CO 1 Apply related engineering technology knowledge in order to provide solution to practice-oriented, industrial-based and/or researchbased problem.

CO 2 Investigate the problem background of engineering technology task and propose a suitable solution to the problem.

CO3 Implement the engineering technology tools using related software and hardware to assist the project development.

CO4 Illustrate the understanding on engineering technologist responsibility towards the society and community

CO5 Organize the project development according to the project planning and schedule in a timely manner.

CO6 Report the technical content of the project accordingly and carry out literature review to understand the project requirement

BTS4826

Engineering Technology Senior Design Project II

Credit:6

Prerequisites: BTS3813

### Synopsis

This course is designed to expose the students to a senior design project. They have to apply all the knowledge that they have learned in the program to complete the senior design project. Each student will be supervised by at least one lecturer. During the senior design project I, the students will be

able to do a literature survey and prepare a draft which contains objective of the project, problem statement, literature survey, solving techniques, methodology, and expected result and list of reference publications. At the end of this subject, the students are required to present the proposal draft in a short seminar which will be evaluated by a faculty's panel.

### Course Outcome

CO 1 Analyze the outcome of the project development based on the project objectives as well as benchmark with related standard.

CO 2 Design and develop the engineering technology project to solve the objectives of the practice-oriented, industrial-based and/or research-based problem.

CO 3 Utilize the engineering technology tools using related software and hardware to assist the project development

CO 4 Illustrate the ethical awareness and profesionalism in providing the solution of the engineering technology project

CO5 Consider the impact of the engineering technology project that is being designed from the societal and environmental point of view.

CO6 Report the technical content of the project accordingly and carry out literature review to understand the project requirement

BTS4812

Industrial Training

Credit:12

Prerequisites: All Subject

### Synopsis

In Industrial Training the students should gain insight into industrial practice, in order to visualize the tasks and possibilities of their later occupation work. All students are required to undergo and industrial training for a certain period that has been agreed by the faculty during last semester of the academic year. The performance of each student during the periods of his/her industrial training is evaluated by the faculty staff, and the representatives from employer organization.

### Course Outcome

CO 1 Identify and investigate problems at

industry, and propose solution using the acquired technical skills.

CO 2 Perform as a professional trainee in an organization during the industrial training

CO 3 Demonstrate a professional commitment and responsibilities at workplace.

CO 4 Present the outcomes of industrial training in a formal oral and report writing presentation.

CO 5 Conduct analyses on any technical issues discovered during industrial training

### ELECTIVE COURSES

BTS4713

Advanced Microprocessor

Credit:3

Prerequisites: BTE3253

#### Synopsis

In this course, students will extend their knowledge on advanced microprocessor/microcontroller's features such as real-time clock and serial communication. Various types of sensor and wireless devices will also be introduced by examining their operation, configuration and connection. An embedded-based system will be explored by developing team projects.

#### Course Outcome

CO 1 Describe the configuration and operation of microprocessor/microcontroller for sensor utilization, serial and wireless communication

CO 2 Develop programs for variety of advance microprocessor/microcontroller application

CO 3 Achieve in constructing a microprocessor/microcontroller embedded system using specific resources and modern engineering technology tools.

CO4 Demonstrate the awareness of referencing through microprocessor/microcontroller's manual and datasheet for further development

BTS4723 Software Engineering

Credit:3

Prerequisites: None

#### Synopsis

This course presents an introduction to software engineering concepts including: software engineering paradigms, requirements specification, design, software evolution and reliability. This course also describes the concepts and methods of information system analysis and design (structured approach), with an emphasis on system analysis methods and tools.

#### Course Outcome

CO 1 Distinguish the important terminology and activities involves (theoretically and practically) related to foundation concepts of software engineering and software development

CO 2 Create solution by using appropriate tools and techniques to solve problem related to software engineering

CO 3 Show system design solutions (structured design approach) from a case study that comply with the stages of systems development life cycle.

CO4 Display an ethical and professional values in carrying out the given tasks

CO5 Demonstrate lifelong learning skills in software engineering practice

BTS4733

Internet Programming

Credit:3

Prerequisites: None

#### Synopsis

This course introduces the fundamentals of internet and world wide web including the concept of HTML, XHTML and CSS. The course also covers the creation of Internet based applications using the Java Scripts programming language and provides an in-depth knowledge for the creation of dynamic web application with enhanced features by introducing various programming techniques XML and RSS using Java Scripts.

#### Course Outcome

CO 1 Describe the principles of internet and web based applications.

CO 2 Design web based applications prototype using appropriate technique to solve specific problem.

CO 3 Construct web based applications prototype using HTML, web server, database and scripting language

CO 4 Explain the impact of the developed web based applications for sustainable development

## CURRICULUM STRUCTURE BACHELOR OF ENGINEERING TECHNOLOGY (ELECTRICAL) WITH HONOURS

YEAR SEMESTER	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
	BTU1113 Physics	BUM1223 Calculus	BUM2113 Applied Mathematics	BTM3234 Manufacturing Computer Applications	BTM3912 Engineering Ethics	BTM3514 Computer Integrated Manufacturing	BTE4743 Power Electronics	BTE4812 Industrial Training
	BTU1112 Physics Laboratory	BTE1313 Instrumentation and Measurements	BTM1114 Basic Manufacturing Processes	BTE2113 Analog Electronics	BTE2413 Electrical Power System	BTE3254 Microprocessors and Interfacing	BTE4**3 Elective I	
	BUM1113 Technical Mathematics	BTE2223 Circuit Analysis I	BTM1614 Computer-Aided Drafting	BTE2112 Analog Electronics Laboratory	BTE3223 Digital Logic Design	BTE3252 Microprocessors and Interfacing Laboratory	BTE4**3 Elective II	
	BTE1122 Electrical Installation Workshop	BTE2222 Circuit Analysis I Laboratory	BTE2233 Circuit Analysis II	BTE3143 Electric Machines and Transformers	BTE3222 Digital Logic Design Laboratory	BTE3323 Control Systems	BTE4**3 Elective III	
<b>COURSES</b>	BTE1213 Electrical Fundamentals	UHC1012 Falsafah dan Isu Semasa	BTE2232 Circuit Analysis II Laboratory	BTE3142 Electric Machines and Transformers Laboratory	BTE3233 Communication System Design	BTE3322 Control Systems Laboratory	BTE4826 Engineering Technology Senior Design Project II	
	BTE1212 Electrical Fundamentals Laboratory	UHC2022 Penghayatan Etika dan Peradaban	UHL2422 English for Technical Communication	UHL2432 English for Professional Communication	BTE3232 Communication System Design Laboratory	BTE3813 Engineering Technology Senior Design Project I		
	BTE2313 Computer Programming	UHL2412 English for Academic Communication	UHF11*1 Foreign Language I	UHF21*1 Foreign Language 2	BTE3262 Electrical Automation			
	UHL2400 Fundamentals of English Language	UGE2002 Technopreneurship		UQA2002 Co-curriculum	UHS1022 Soft Skills			
<b>TOTAL CREDIT PER SEMESTER</b>	<b>18</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>18</b>	<b>18</b>	<b>12</b>
<b>OVERALL TOTAL CREDIT FOR GRADUATION</b>	<b>142</b>							

**ELECTIVE COURSES FOR  
BACHELOR OF ENGINEERING TECHNOLOGY (ELECTRICAL) WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BTE4713	Programmable Logic Controller	3
2	BTE4723	Advanced Electronics Circuits	3
3	BTE4733	Sensors Technology	3
4	MEE3213	Power Electronics Design	3
5	MEE3313	Photovoltaic System Design	3
6	MEE3323	Energy Storage	3
7	MEE3333	Wind Energy System	3
<b>Total minimum credits of elective courses for graduation</b>			<b>9</b>

<b>PROGRAMME EDUCATIONAL OBJECTIVES (PEO)</b>	
PEO1	To prepare graduates in electrical engineering technology field with mastery of the needed expertise in industries.
PEO2	To prepare graduates in electrical engineering technology field that demonstrated hands-on skills for professional and personal development.
PEO3	To prepare graduates in electrical engineering technology field with good management skill and ethically professional.

<b>PROGRAMME OUTCOMES (PO)</b>	
PO1	Apply knowledge of mathematics, science, engineering fundamentals and engineering technology principles to define and applied engineering technology procedures, processes, systems or methodologies in electrical engineering technology area
PO2	Solve broadly-defined engineering technology problems systematically to reach substantiated conclusions by using appropriate tools and techniques in electrical engineering technology field
PO3	Design solutions for broadly-defined electrical engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns
PO4	Plan and conduct experimental investigations of broadly-defined engineering technology problems by using data from relevant sources
PO5	Select and apply appropriate techniques, resources and modern engineering technology tools, with an understanding of their limitations
PO6	Function effectively as individuals, and as members or leaders in diverse technical teams
PO7	Communicate effectively with the technical community and society at large
PO8	Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities
PO9	Demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices
PO10	Demonstrate an awareness of management, business practices and entrepreneurship
PO11	Demonstrate an understanding of the impact of technical practices, taking into account the need for sustainable development
PO12	Recognize the need for professional development and to engage in independent and lifelong learning

**COURSE SYNOPSIS****BACHELOR OF ENGINEERING  
TECHNOLOGY (ELECTRICAL) WITH  
HONOURS**CORE FACULTY

BTU1112  
Physics Laboratory  
Credit: 2  
Prerequisites: None

## Synopsis

This laboratory introduces the students with the application of physics concept in engineering devices such as Free Fall, Bernoulli's Law, Hydrostatic Pressure And Electric Field. The concepts of physics introduced related in mechanics or dynamics motion and basic concepts of electrical area. The students will learn how to run the experiment with referring the basic concepts of physics during the lab hours.

## Course Outcome

CO 1 Understanding the basic concepts, theories and principles of physics in engineering application  
CO 2 Demonstrating skills in logical thinking in handling equipment.  
CO 3 Applying basic physics concepts to problem solving  
CO 4 Applying physics knowledge to personal decisions involving physical problems

BTU1113  
Physics  
Credit: 3  
Prerequisites: None

## Synopsis

This course introduces a fundamental of physics. It covers unit and measurements, kinematics, forces and Newton's law of motion, statics equilibrium, work, energy and power, fluid mechanics, electric and magnetism

## Course Outcome

CO 1 Understand the basic concepts, theories and principles of physics in engineering application  
CO 2 Solve physics problems such as in kinematics, forces and static equilibrium  
CO 3 Discuss physics quantity such as work, energy and power in a team  
CO 4 Applying basic laws to solve fluid, electrical and magnetism problems

BUM1113  
Technical Mathematics  
Credit:3  
Prerequisites: None

## Synopsis

This course introduces and discusses the fundamental of mathematics focusing on providing a solid theoretical foundation for further work. Student are exposed to complex number, functions and graphs, trigonometric functions, analytic geometry, polar coordinates, 3 dimensional spaces and vector. Appropriate software is used by students to implement some of these ideas in practice.

## Course Outcome

CO 1 Apply appropriate mathematics concepts to solve various technological problems.  
CO 2 Use appropriate software and tool to solve the graphical and computational problems in mathematics  
CO 3 Analyze and think critically a wide range of problem and solve it using ideas and methods in calculus.  
CO 4 Relate and applied the concepts and methods studied into other courses.

BUM1223  
Calculus  
Credit:3  
Prerequisites: None

## Synopsis

This course discusses Differentiation and applications, techniques of integration and applications, numerical integration and Taylor polynomial, Taylor Series & Maclaurin Series.  
Course Outcome

CO 1 Understand the fundamental concepts of the calculus and connect them with the real world problem.

CO 2 Solve any related problem involving differentiation and integration.

CO 3 Apply the concepts and methods studied into other related courses.

CO 4 Communicate effectively in written and oral form through group discussion.

CO 5 Attain computational facility in differential and integral calculus.

BUM2113

Applied Mathematics

Credit:3

Prerequisites: None

Synopsis

This course introduces and discusses Partial Derivatives, Double Integrals, First Order Differential equations and Second Order differential equations.

Course Outcome

CO 1 Analyze and apply the knowledge of Multiple Integrations to solve various science and engineering problems.

CO 2 Analyze and solve various differential equation problems by using the basic principles and methodologies of First Order differential equations and Second Order differential.

CO 3 Apply the concepts and methods studied into other related courses.

CO 4 Communicate effectively in written and oral form through group discussion.

BTE2313

Computer Programming

Credit: 3

Prerequisites: None

Synopsis

Fundamental principles and concepts of C++ programming, with definitions of data, expressions, control-flow constructions, functions, input and output and preprocessing. Basic problem solving and programming techniques, structured programming ideas, fundamental algorithms and data structures

(array).

Course Outcome

CO 1 Construct computer programs using C++ language

CO 2 Develop appropriate programming techniques and program control structures

CO 3 Display the ability to use IDE (Integrated Design Environment) for C++

CO4 Propose an algorithm for a specific problem by implementing appropriate programming techniques.

CORE PROGRAM

BTE1122

Electrical Installation Workshop

Credit: 2

Prerequisites: None

Synopsis

This course introduces students to the single phase domestic wiring and installation. The students will learn about supply system, rules and regulation, wiring system and electrical protection system. They are also will practice in applying trunking and conduits for electrical wiring as well as doing fitting and installation of electrical system devices. Students need to construct the single phase domestic wiring and installation for lighting, socket outlet, fan and air conditioner. They are also will conduct inspection and testing on their wiring and installation as safety confirmation and fulfil the regulations.

Course Outcome

CO 1 Interpret rules and regulation for electrical wiring comprising of cable selection and load calculation

CO 2 Construct single phase electrical installation for domestic wiring using suitable wiring tools and accessories

CO 3 Perform inspection and testing in electrical wiring and installation.

CO4 Apply ethical principles and safety in electrical wiring installation

BTE1212

Electrical Fundamentals Laboratory

Credit: 2



Prerequisites: None

### Synopsis

This course introduces students to the fundamentals laboratory of DC and AC circuits and basic network laws and theorems. The students will be handling the basic measurement equipment to measure and analyse the parameter of the electrical circuits.

### Course Outcome

CO 1 Construct simple electrical and electronics and simulate the operation of the circuits using circuit simulation software (OrCAD).

CO 2 Measure parameter of electrical circuits (resistance, voltage, current, etc)

CO 3 Work ethically and effectively as an individual and in a group

BTE1213

Electrical Fundamentals

Credit:3

Prerequisites: None

### Synopsis

This module will introduce students to basic science of electricity, introduction to instrumentation and measurement, work and energy theorem, basic electrical circuits and introduction to magnetism.

### Course Outcome

CO 1 Describe the basic concept of electricity, conductors, insulators, circuit, magnetism and other devices.

CO 2 Apply basic electrical laws such as Ohm and Kirchhoff Law to solve circuit or electrical problems.

CO 3 Shows the ability to communicate effectively.

BTE1313

Instrumentation & Measurements

Credit:3

Prerequisites: None

### Synopsis

This course introduces students to the principles of instrumentation and measurements, determination of error that caused by the meters. The students will be exposed to the architecture and the operation of DC and AC meters, oscilloscope, signal generator, storage instrument and display devices, analysis of DC and AC meters and introduction to signal conditioning.

### Course Outcome

CO 1 Explain the basic concept of Instrumentation & measurement system including the operation, calibration and calculation

CO 2 Solve problems regarding AC & DC meters, oscilloscope and signal generator

CO 3 Construct the operation of meters, measuring devices or signal conditioning circuits into trainer board and interpret the experimental results into report.

CO4 Understand the functional role of individual towards task accomplishment

BTE2222

Circuit Analysis I Laboratory

Credit:2

Prerequisites: BTE1212

### Synopsis

This course introduces the basic laboratory of DC and AC circuit analysis. The contents include Ohm's Law, Kirchhoff's Law, series and parallel circuits, Mesh and Nodal analysis, superposition theorem, Thevenin and Norton equivalent of a complex circuit. The student will be handling measuring of capacitance, measure capacitor charge and discharge times, RL, RC circuits, phase difference, measure power in various type of circuits.

### Course Outcome

CO 1 Construct various electrical circuits and properly use lab equipment to measure, analyse and troubleshoot the circuits. (P5)

CO 2 Solve the DC circuit problems using nodal analysis and mesh analysis, Thevenin and Norton equivalent and evaluate the most efficient methods among them. (P1)

CO 3 Demonstrate the role of individual in team to achieve task completion. (A4)

BTE2223  
Circuit Analysis I  
Credit:3  
Prerequisites: BTE1213

#### Synopsis

This course introduces the engineering methods of DC circuit analysis. The contents include Mesh and Nodal analysis, Source Transformation, and 4 main network Theorems: Superposition, Thevenin, Norton and Maximum Power Transfer theorems. It also includes the basic of DC transients in capacitors and inductors. Introduction to AC fundamentals and impedance concept of RLC circuits are also covered.

#### Course Outcome

CO 1 Analyse DC circuit using various methods of DC Analysis. (C4)  
CO 2 Apply Network Theorems to simplify and solve complex DC circuits. (C3)  
CO 3 Explain the effects of DC transients on capacitors and inductors. (C4)  
CO 4 Understand the AC circuit characteristics and show the ability to describe them effectively. (A2)  
CO 5 Describe R, L,C concepts in practical and relates them with the real industrial practice. (A3)

BTM1114  
Basic Manufacturing Process  
Credit:4  
Prerequisites: None

#### Synopsis

This course intended to introduce to materials, techniques, and equipment of industrial manufacturing. Emphasis on laboratory demonstration and simulation activities such as machining, welding, casting, and forming operations.

#### Course Outcome

CO 1 Explain the structure and properties of basic engineering materials and their relationship to manufacturing.  
CO 2 Describe the fundamental equipment and processes employed in common manufacturing operations.

CO 3 Identify process parameters and how they affect the manufacturing processes.

BTE2232  
Circuit Analysis II Laboratory  
Credit:2  
Prerequisites: BTE2222

#### Synopsis

This course provides the basic concepts and engineering methods of AC circuits. The contents include applications of Mesh and Nodal analysis, Superposition and Source Transformation Theorems, Thevenin and Norton Theorem. Resonant circuit, Filters, Bridges and Balanced 3-phase circuits are also covered.

#### Course Outcome

CO 1 Construct AC circuits and validate circuit analysis theorems. (P5)  
CO 2 Assemble schematic circuits in actual circuit and interpret the experimental results into report. (P2)  
CO 3 Work in a team and communicate effectively. (A3)

BTE2233  
Circuit Analysis II  
Credit:3  
Prerequisites: BTE2223

#### Synopsis

This course provides the basic concepts and engineering methods of AC circuits. The contents include applications of Mesh and Nodal analysis, Superposition and Source Transformation Theorems, Thevenin and Norton Theorem. Resonant circuit, Filters, Bridges and Balanced 3-phase circuits are also covered.

#### Course Outcome

CO 1 Solve the basic AC parameters in simple AC Series-Parallel Circuits and resonant circuits. (C3)  
CO 2 Analyze AC circuits and magnetically couple circuit problems using theorems in AC circuits. (C4)  
CO 3 Define the power parameters, power

factor correction and resonance parameters in AC circuits. (C3)

CO4 Demonstrate the role of individual in team to achieve task completion. (A4)

BTM1614

Computer-Aided Drafting

Credit:4

Prerequisites: None

### Synopsis

This subject is designed to introduce to the students the principle of computer-aided design. Topics includes Drafting Overview, Drawing Set-up , Basic CAD ,Commands Geometric Construction , Orthographic Projection , Basic Drawing ,Tools, Pictorial Drawings, Sectional Views, Advance CAD Commands, Modifying CAD,Drawings, Dimensioning, Tolerances, Working Drawings, Threads and Fasteners

### Course Outcome

CO 1 Analyze problem in technical drawing and understand drawing

CO 2 Use basic geometric construction techniques to create objects in CAD

CO 3 Project a 3 dimensional object in 2 dimensional space with the proper utilization of views in CAD

CO 4 Read & create dimensioned drawings using conventional techniques in CAD.

CO 5 Identify and understand the components of working drawings & the standards that apply.

BTM3234

Manufacturing Computer Application

Credit:4

Prerequisites: BUM1113

### Synopsis

Overview of computer hardware, software, and processing concepts related to the control of manufacturing tasks. Emphasis on use of integrated software packages in the solution of a variety of manufacturing problems. Laboratory assignments in automation control, real time data sampling, and creation of user interfaces.

### Course Outcome

CO 1 Apply software development for technology problem solving.

CO 2 Perform adaptive programming skills for more diverse application environment.

BTE2112

Analog Electronics Laboratory

Credit:2

Prerequisites: BTE2233

### Synopsis

This course covers the laboratory / practical implementation related to diode characteristics, half-wave and full-wave rectifiers, Zener diode characteristic, Voltage regulator, BJT characteristics, BJT's Common Emitter Amplifier, MOSFET characteristics and MOSFET's COMmon Source Amplifier.

### Course Outcome

CO 1 Measure electronics devices characteristics. (P3)

CO 2 Construct electric circuits and measure electronics parameters using diode and transistors. (P5)

CO3 Build and simulate the operation of electric circuits in a team. (A3)

BTE2113

Analog Electronics

Credit:3

Prerequisites: BTE2233

### Synopsis

The course covers analog electronics topics such as the P-N Junction Diode, Diode Applications, Bipolar Junction Transistors (BJT), DC Biasing of the BJT Amplifier, Transistor Modelling, Cascade Amplifier, Small-Signal BJT Amplifier, Metal-Oxide-Semiconductor FET (MOSFET), MOSFET Amplifier, Frequency Response of BJT and FET Amplifiers.

### Course Outcome

CO 1 Describe the working principle and function of different types of diodes. (C2)

CO 2 Analyse different types of BJT in DC and AC circuit configurations using appropriate techniques. (C4)

CO3 Analyse different types of MOSFET in DC and AC circuit configurations using

appropriate techniques. (C4)  
CO4 Examine the BJT/MOSFET circuit especially for multistage amplifier applications. (C4)

BTE3222  
Digital Logic Design Laboratory  
Credit:2  
Prerequisites: None

#### Synopsis

This course covers the laboratory experiments on digital circuits design and verification, using various digital circuit components. Combinational design techniques as well as sequential design techniques are presented with the use of Karnaugh mapping, state transition diagrams and tables are also included in the course.

#### Course Outcome

CO 1 Apply basic logic gates, combinational logic circuit and sequential logic circuit using commercial IC. (P1)  
CO 2 Construct a digital system using medium scale integrated (MSI) logic and counter/shift register. (P3)  
CO 3 Communicate effectively in a team. (A3)

BTE3223  
Digital Logic Design  
Credit:3  
Prerequisites: None

#### Synopsis

This course emphasizes on the fundamental of digital electronics. The student is first taught about the number system and logic gates before introducing them to digital IC. Then they are exposed to both combinational logic network and combinational Medium Scale Integrated (MSI) logic. In concurrence with this, the fundamental of sequential logic, flip-flop, counter and shift register are taught.

#### Course Outcome

CO 1 Describe in details the principles of digital logic systems. (C2)  
CO 2 Analyze combitional logic system for

Medium Scale Integrated (MSI) logic design. (C4)  
CO 3 Analyze and design sequential logic system for counters and registers. (C4)  
CO 4 Construct digital logic circuit. (C3)  
CO 5 Work in a team and/or as a leader to accomplish given task. (A3)

BTE3262  
Electrical Automation  
Credit:2  
Prerequisites: None

#### Synopsis

This course introduces student to electrical switching circuit design and construction. Students will learn how to design hard wire controller using the combination of switches, transistor, relay, timer, sensors, motor, etc.

#### Course Outcome

CO 1 Identify suitable voltage supply for electrical circuit. (C2)  
CO 2 Design a switching circuit for electrical automation system. (P5)  
CO 3 Construct a control circuit which consists of electrical and electronic components. (P5)  
CO 4 Work in a team and communicate effectively. (A3)

BTE3142  
Electrical Machines and Transformers Laboratory  
Credit:2  
Prerequisites: BTE2233

#### Synopsis

This course introduces the fundamental concepts and principles of transformer and various types of electrical machines. It is intended for students to understand fundamental aspects of rotating electrical machines. The first part of the course is a quick review of some electromagnetism fundamental while the following will deal with the transformers and different types of electrical machines.

#### Course Outcome

CO 1 Displays the transformer and machines equivalent circuits and the operating conditions for electrical machines under steady state conditions. (P2)

CO 2 Construct driver circuit for DC and AC motor. (P5)

CO 3 Measure, determine and interpret the parameters of transformer and torque-speed characteristics of rotating machines. (A3)

BTE3143

Electrical Machines and Transformers

Credit:3

Prerequisites: BTE2233

### Synopsis

This course introduces the fundamental concepts and principles of transformer and various types of electrical machines. It is intended for students to understand fundamental aspects of rotating electrical machines. The first part of the course is a quick review of some electromagnetism fundamental while the following will deal with the transformers and different types of electrical machines.

### Course Outcome

CO 1 Analyze the transformer and machines equivalent circuits and the operating conditions for electrical machines under steady state conditions. (C4)

CO 2 Determine the parameters of transformer and characteristics of rotating machines. (C3)

CO 3 Determine the importance the parameters of electrical machines in industry in group. (A3)

BTM3912

Engineering Ethics

Credit:2

Prerequisites: None

### Synopsis

This subject gives an overview of engineering, the profession and its requirement in Malaysia scenario. Topics that will be included ethics, management and contribution of engineering also generic skills and study skills. Moreover, this subject can enhance students knowledge

about obligation of engineers/technologists to the clients, professionals and society, ethical codes, safety codes.

### Course Outcome

CO 1 Explain Engineering ethics, management and contribution.

CO 2 Analyze and comprehend the indispensable ethics, professionalism, responsibility, skills of teamwork and leadership

CO 3 Justify systematic approach to the ethical issue in the industry and engineering field

BTE3232

Communication System Design Laboratory

Credit:2

Prerequisites: BTE2232

### Synopsis

This course introduces theories in the area of communication systems. Topics covered include the basic elements of communications, signal analysis, amplitude modulation, frequency modulation, and single sideband modulation.

### Course Outcome

CO 1 Measure, determine, perform and interpret the parameter from various type of modulation and demodulation process. (P2)

CO 2 Construct the various type of modulation and demodulation process. (P4)

CO 3 Discuss the basic electronic communication system. (A3)

BTE3233

Communication System Design

Credit:3

Prerequisites: BTE2233

### Synopsis

This course introduces theories in the area of communication systems. Topics covered include the basic elements of communications, signal analysis, amplitude modulation, angle modulations and digital modulations, as well as transmission channels and noise impact on the modulation system.

Finally, some emergence of digital communication technologies are presented and compared.

#### Course Outcome

CO 1 Understand various types of modulation and demodulation techniques. (C2)

CO 2 Analyze related parameters to the transmitter and receiver using amplitude modulations in analog communication application. (C4)

CO 3 Solve related parameters to the transmitter and receiver using modulation in analog communication application. (C4)

CO 4 Demonstrate the concept of communication system in the form of presentation / technical report writing. (A3)

#### BTE3252

Microprocessor and Interfacing Laboratory

Credit:2

Prerequisites: BTE2313 & BTE3223

#### Synopsis

This course is an introduction to a microprocessor/microcontroller. Students are exposed to the internal architecture of the microprocessor/ microcontroller, various instruction sets, and basic hardware design of embedded system.

#### Course Outcome

CO 1 Explain the architecture of the microprocessor/microcontroller system and its interface. (P2)

CO 2 Develop programs for applications in embedded systems using Assembly and C language. (P4)

CO 3 Work in a team and communicate effectively. (A3)

#### BTE2413

Electrical Power System

Credit:3

Prerequisites: BTE3143

#### Synopsis

This course introduces the fundamentals of essential elements of electrical power

systems. The students will be exposed to electric power generation, transmission, distribution and basic power system design. It also includes operation concepts of switchgear, sub-station, and power systems protection techniques. In concurrence with this, the fundamental of power system analysis will be introduced.

#### Course Outcome

CO 1 Understand the concept of electrical power system, power generation and power transmission system as well as the functions of respective system/facility (switchgear, protection and sub-station). (C2)

CO 2 Develop the power system representation using per-unit system and carry out the performances of power transmission lines and distribution systems (C4).

CO 3 Analyse characteristics parameters and evaluate the performance of power system elements using suitable softwares/tools. (P4)

CO 4 Demonstrate the communication ability towards task completion. (A4)

#### BTE3254

Microprocessor and Interfacing

Credit:4

Prerequisites: BTE2313 & BTE3223

#### Synopsis

This module is an introduction to a microprocessor/microcontroller. Students are exposed to the internal architecture of the microprocessor / microcontroller, various instruction sets, program developing for applications in embedded systems using C language and basic hardware design of embedded systems.

#### Course Outcome

CO 1 Illustrate the architecture of the microprocessor / microcontroller system and develop programs for applications in embedded system using assembly language. (C3)

CO 2 Develop basic programs for applications in embedded systems using "C" language. (C6)

CO 3 Develop advance programs for

applications in embedded systems using “C” language. (C6)

CO 4 Work in a team and communicate effectively. (A3)

BTE3322

Control System Laboratory

Credit:2

Prerequisites: BUM2113 & BTE2233

Synopsis

This course introduces students to the control system technology, mathematical models of feedback systems. The students will be exposed to transient and steady-state analysis, root locus, frequency response and PID Response.

Course Outcome

CO 1 Construct mathematical models of a Control Systems' Components using Computer aided tools (Modern Tool Usage). (P5)

CO 2 Validate the theoretical calculation for Controls Systems Responses using Modern tools (Example: PID Controller). (P4)

CO 3 Propose relevant information on control systems engineering technology by referring various information sources. (A3)

BTE3323

Control System

Credit:3

Prerequisites: BUM2113 & BTE2233

Synopsis

This course introduces students to the control system technology and mathematical models of feedback systems. Among the topics covered are transient and steady-state analysis, as well as stability analysis using root locus and Bode Plot (frequency response). Controller design will also be introduced in this course including the use of PID controller.

Course Outcome

CO 1 Apply the fundamental concept and theories of control systems and formulate the transfer function of electrical and mechanical systems. (C3)

CO 2 Analyze and simplify complex systems interconnection using block diagrams reduction and signal flow graphs methods. (C4)

CO 3 Identify the stability and steady-state errors of control system and solve control system problems by utilizing root locus and bode plot methods. (C4)

CO 4 Design the compensation technique that can be used to stabilize control systems. (C6).

CO 5 Demonstrate the ability to communicate effectively. (A4)

BTE3813

Engineering Technology Senior Design I

Credit:3

Prerequisites: None

Synopsis

This course is designed to expose the students to a senior design project. They have to apply all the knowledge that they have learned in the programme to complete the senior design project. Each student will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor). During the senior design project I, the students will be able to do a literature survey and prepare a draft which contains objective of the project, problem statement, literature survey, solving techniques, methodology, expected result, treatment of results and list of reference publications. At the end of this subject, the students are required to present the draft in a short seminar which will be evaluated by a faculty's panel.

Course Outcome

CO 1 Apply related engineering technology knowledge in order to provide solution to practice-oriented, industrial-based and/or research-based problem. (C3)

CO 2 Investigate the problem background of engineering technology task and propose a suitable solution to the problem. (C5)

CO 3 Utilize the engineering technology tools using related software/hardware to assist the project design. (P3)

CO 4 Illustrate the understanding on engineering technologist responsibility towards the society and community. (A3)

CO 5 Organize the project development

according to the project planning and schedule in a timely manner. (A4)

CO 6 Report the technical content of the project accordingly and carry out literature review to understand the project requirement. (A3)

BTM3514

Computer Integrated Manufacturing

Credit:4

Prerequisites: None

### Synopsis

Three basic themes will be stressed throughout the course. First, developing manufacturing strategy involves considering factors beyond the traditional boundaries of the manufacturing function. Such factors include the overall competitive position of the firm, the nature of market demand, competitor's actions, government regulations, and so on. Second, there is a strong linkage between a firm's competitive strategy and its manufacturing strategy. If this linkage is maintained, operations can become a formidable competitive weapon. If this linkage is neglected, even the best-designed strategies can fail. Finally, the course will consider manufacturing strategy issues in an integrative manner by developing the interrelationship between operations, finance, accounting, and marketing.

### Course Outcome

CO 1 List components of a computerized integrated manufacturing environment.

CO 2 Explain various automation techniques currently used in industry.

CO 3 Develop a systematic plan for manufacturing strategy implementation

CO 4 Develop a systematic plan for manufacturing strategy implementation required for a selected product.

CO 5 Model enterprise manufacturing and automation strategies that respond to national and global manufacturing demands.

BTE4743

Power Electronics

Credit:3

Prerequisites: BTE2113 & BTE2413

### Synopsis

The primary objective of the course is to give students a foundation of knowledge, understanding, analysis and design of power electronics circuits for conversion and control of electrical energy. The course presents concepts, fundamentals analysis tools, practical consideration for design, and a range of power electronics applications. Practical experiments in the laboratory will also be conducted. Students will be exposed to the power converter, PWM switching techniques, DC and induction motor drives.

### Course Outcome

CO 1 Describe the operating principles and the switching characteristics of power electronics converter. (C2)

CO 2 Design power electronics converter in continuous conduction mode (CCM) or discontinuous conduction mode (DCM) and electrical drives for complex engineering problem. (C6)

CO 3 Construct power electronics converter using appropriate equipment / simulation tools. (P5)

CO 4 Plan and communicate as a team to solve the problems related to power electronics circuits. (A3)

BTE4826

Engineering Technology Senior Design Project II

Credit:6

Prerequisites: BTE3813

### Synopsis

This course is designed to expose the students to a senior design project. They have to apply all the knowledge that they have learned in the program to complete the senior design project. Each student will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor). During the senior design project II, the students will be able to fabricate and implement their projects prototypes/models, conduct functionality testing, performance evaluation and finalize their project report. At the end of this subject, the students are required to present and demonstrate their projects in a poster presentation session



which will be evaluated by faculty/industrial panels.

#### Course Outcome

CO 1 Analyze the outcome of the project development based on the project objectives as well as benchmark with related studies. (C4)

CO 2 Develop the proposed design of engineering technology project to solve the practice-oriented, industrial-based and/or research-based problem. (C6)

CO 3 Implement the engineering technology tools using related software and hardware to assist the project development. (P3)

CO 4 Illustrate the ethical awareness and professionalism in providing the solution of the engineering technology project. (A2)

CO 5 Consider the impact of the developed engineering technology project from the societal and environmental point of view. (A4)

CO 6 Report the technical content of the project accordingly and carry out demonstration to prove the project accomplishment. (A3)

#### BTE4912

Industrial Training

Credit:12

Prerequisites: All Subject

#### Synopsis

In Industrial Training the students should gain insight into industrial practice, in order to visualize the tasks and possibilities of their later occupation work. All students are required to undergo and industrial training for a certain period that has been agreed by the faculty during last semester of the academic year. The performance of each student during the periods of his/her industrial training is evaluated by the faculty staff, and the representatives from employer organization

#### Course Outcome

CO 1 Identify and investigate problems at industry, and propose solution using the acquired technical skills. (C3)

CO 2 Perform as a professional trainee in an organization during the industrial training. (A5)

CO 3 Demonstrate a professional commitment and responsibilities at workplace.

(A3)

CO 4 Present the outcomes of industrial training in a formal oral and report writing presentation. (A2)

CO 5 Conduct analyses on any technical issues discovered during industrial training. (C4)

#### ELECTIVE COURSES

##### BTE4713

Programmable Logic Controller

Credit:3

Prerequisites: BTE3223 & BTE3222

#### Synopsis

In this course, basic concepts and skills needed to install, program, and apply programmable electronic controllers in industry. Discrete and analog input/output (I/O) devices and ladder logic will be studied, including basic and intermediate PLC functions. Experiments in operation, programming, and industrial applications with emphasis on discrete I/Os.

#### Course Outcome

CO 1 Analyze the functions of hardware component of programmable logic controllers and PLC programming. (C4)

CO 2 Design proficiency in ladder logic by applying programming skills to implement industrial applications. (C6)

CO 3 Varies a program to operate the manufacturing application. (P2)

CO 4 Display problems in industrial applications requiring PLC's by troubleshooting hardware and software. (A3)

##### BTE4723

Advanced Electronics Circuits

Credit:3

Prerequisites: None

#### Synopsis

Digital to Analog and Analog to Digital Converter Circuits, Class C Amplifier circuit, MOSFET Amplifiers and Switching Circuits, MOSFET DIGITAL SWITCHING circuits, Thyristors circuits and APPLICATIONS, Special-Purpose Op-Amp Circuits, Oscillators circuits, IC Voltage Regulators circuits, and

## Electronics sensing circuits

### Course Outcome

- CO 1 Apply knowledge to solve advanced electronics circuit's problems. (C3)
- CO 2 Design the advanced electronics circuits. (C6)
- CO 3 Build practically advanced electronic circuit. (P1)
- CO 4 Examine the operation of advanced electronic circuit using software tools (EWB). (A4)

BTE4733

Sensor Technology

Credit:3

Prerequisites: None

### Synopsis

This module will introduce students to the structural and functional principles of sensors used for various physical and derived quantities and how to use them to measure these quantities. The type of sensors covered are resistive-based, capacitive-based, inductive-based sensors, strain gauge, piezoelectric and optical based sensors.

### Course Outcome

- CO 1 Describe the principles and operation of how different sensors work. (C2)
- CO 2 Evaluate the characteristics of different type of sensors and identify the appropriate sensor for different applications. (C5)
- CO 3 Conduct various measurements using different types of sensors. (P2)
- CO 4 Propose potential sensor for environment detection and monitoring. (A3)

MEE3213

Power Electronics Design

Credit:3

Prerequisites: None

### Synopsis

The primary objective of this course is to give students an advance knowledge to analyse and design the power electronics circuits for energy conversion in electrical system. The

course presents theoretical concept, design consideration, switching control approach through a range of power electronics applications, especially for renewable energy. Students will be exposed to the application to power converters, inverters and PWM switching techniques.

### Course Outcome

- CO 1 Evaluate the power electronics technology for energy conversion in electrical system
- CO 2 Design the power electronics circuits for solving electrical engineering problem
- CO 3 Construct the power electronics circuit using software or laboratory environment
- CO 4 Demonstrate solution for application of power electronics technology

MEE3313

Photovoltaic System Design

Credit:3

Prerequisites: None

### Synopsis

This course discusses on the importance of alternative energy, particularly solar photovoltaic to the world's energy security problem. Students will learn the fundamental concept photovoltaic system and their roles in the energy conversion process. Problem based learning will be utilised to expose the student into real situation of PV system design with requirements and limitations. The design will focus on not only the technical aspects, but also impacts to financial, cultural, societal or environmental. Emerging technologies in the related field will also be explored.

### Course Outcome

- CO 1 Explain the scenario of energy security and the role played by alternative energy especially solar photovoltaic.
- CO 2 Design a comprehensive solar photovoltaic system according to requirements and limitations.
- CO 3 Evaluate the potential impact of solar photovoltaic development in term of financial, societal, cultural or environmental.

MEE3323

Energy Storage

Credit:3

Prerequisites: None

### Synopsis

This course introduces the fundamental concepts and principles of various types of energy storage technologies. The course covers an overview of different technologies of energy storage namely electrical, mechanical, electrochemical and chemical energy storage. The course is intended for students to understand fundamental aspects of various types of energy storage technologies and further develop or use the fundamental theories of energy storage in new situations or multi-disciplinary contexts. Besides, the course requires students to evaluate the performance as well as to provide solution to technical problem with respect to the use of different technologies of energy storage for different application.

### Course Outcome

CO 1 Acquire fundamental principles of energy storage technologies for further develop or use in new situations or multi-disciplinary contexts

CO 2 Analyze the performance of different types of energy storage under different operating conditions

CO 3 Recognize the needs for, and possess the capability in life-long learning

MEE3333

Wind Energy Systems

Credit:3

Prerequisites: None

### Synopsis

This course provides an overview of wind turbine technology and energy concepts. A brief history of windmills, various types of wind turbines and their design will be given. Students will learn a basic understanding of the aerodynamics, dynamics and control of wind turbines, as well as of their design and operation. The electrical generator which is the major part of wind turbine system will be explained. Student will be also exposed to the advanced application of wind energy system that is the system design with grid connected and off grid system. Future development of wind energy and new technology in the

system design of wind power generation will be covered.

### Course Outcome

CO 1 Acquire fundamental principles of wind energy for further develop or use in new situations or multi-disciplinary contexts

CO 2 Analyze the performance of wind energy system under different operating conditions

CO 3 Design and solve technical problem with respect to wind turbine system for power generation with respect to environment consideration

## CURRICULUM STRUCTURE BACHELOR OF TECHNOLOGY IN ELECTRICAL SYSTEMS MAINTENANCE WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	THIRD	THIRD
	BVE1114 Electrical System Drafting and Simulation	BVE1215 Solar PV Installation and Maintenance	BVE2315 Building Electrical System Maintenance	BVE2415 Electrical Machine and Drive System Integration	BVE3515 Industrial Machinery Control System Design	BVE3614 Maintenance Management System (MMS)	BVE3716 Final Year Project 2	BVE4112 Industrial Training
	BVE1124 Technical Reporting	BVE1225 Switchboard Maintenance and Calibration	BVE2325 Renewable Energy System Maintenance	BVE2425 Energy Efficiency Optimization	BVE3525 Monitoring System Integration	BVE3624 Project Planning and Execution		
	BVE1135 Electrical System Measurement and Testing	BVE1233 Professional Practices	BVE2335 Generator System Maintenance	BVE2433 Collegality Interaction and Management	BVE3534 Industrial Data Analysis	BVE3634 Final Year Project 1		
	UHS1022 Soft Skills	UQA2002 Co-Curriculum	UHL2452 English for Vocational Purposes	BVE2444 Technopreneur Project 1	BVE3544 Technopreneur Project 2			
	UHC2022 Penghayatan Etika dan Peradaban	UHC1012 Falsafah dan Isu Semasa	UGE2002 Technopreneurship	UHF1111 Mandarin for Beginners	UHF2111 Mandarin for Intermediate			
		UHL2422 Essential English						
<b>TOTAL CREDIT PER SEMESTER</b>	<b>17</b>	<b>19</b>	<b>19</b>	<b>18</b>	<b>19</b>	<b>12</b>	<b>6</b>	<b>12</b>
<b>OVERALL TOTAL CREDIT FOR GRADUATION</b>	<b>122</b>							

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	To produce electrical system maintenance technologist that perform maintenance related work including electrical maintenance, facility manager, and energy manager.
PEO2	To produce Technopreneur in electrical related technology.
PEO3	To produce relevant, respected and referred professionals in electrical maintenance technology

PROGRAMME OUTCOMES (PO)	
PO1	Apply knowledge of technology fundamentals to broadly-defined procedures processes, systems and methodologies in electrical system maintenance.
PO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems.
PO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in electrical system maintenance.
PO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	Demonstrate an awareness of management and technopreneurship practices in real perspective.
PO8	Demonstrate professionalism and social and ethical consideration.
PO9	Demonstrate leadership quality, mentoring and work effectively in diverse teams.

## COURSE SYNOPSIS

### BACHELOR OF TECHNOLOGY IN ELECTRICAL SYSTEM MAINTENANCE WITH HONOURS

#### CORE FACULTY

BVE1114

Electrical System Drafting & Simulation

Credit: 4

Prerequisites: None

#### Synopsis

The main objective of this course is to expose the Bachelor Technology students with skills of Computer Aided Drafting and its application. This course provides the student an exposure of electrical installation design for low voltage application. It introduce the student for electrical symbol, design lighting and switch socket outlet (S/S/O) required and design schematic diagram for DB, SSB and MSB.

#### Course Outcome

CO 1 Apply general knowledge on electrical installation using Computer Aided Drafting software.

CO 2 Produce electrical installation drawings using CAD software.

CO 3 Propose electrical layout and single line diagram for electrical installation based on proper standard.

CO 4

BVE1124

Technical Reporting

Credit: 4

Prerequisites: None

#### Synopsis

Technical reporting course is learn about a formal report designed to convey technical information in a clear and easily accessible format. Technical report is a document

describes the process, progress or result of technical or state of technical problem. It also learn how to make recommendation and conclusions of a project. Technical report is a review process, it is often limited to within the originating organization. Students compose, design, revise, and edit effective reports, descriptions, instructions, and employment documents. Emphasizes precise use of language and graphics to communicate complex technical and procedural information safely, legally and ethically.

#### Course Outcome

CO 1 Produce technical and professional documentation and visuals using appropriate technique.

CO 2 Prepare reports using proper software to convey technical information in a clear and easily accessible format.

CO 3 Demonstrate the ability to grab various technical information in order to produce good proposal reports.

CO 4

BVE1135

Electrical System Measurement and Testing

Credit: 5

Prerequisites: None

#### Synopsis

This course covers the fundamentals circuit analysis such as Kirchoff's laws, parallel and series circuits. This course provides an introduction to the fundamentals of measurement standards, measurement errors, operation of electrical measuring instruments and their testing and calibration. In addition, this course also covers the used of potentiometer for measurement of resistance and voltmeter and ammeter calibrations. Measuring earth resistance for electrical grounding systems

as well as insulation resistance and leakage current test are among the topics that will be covered in this course. Overall, it emphasizes the principles and analytical models used by engineers and technologists to design, develop and test electrical systems.

#### Course Outcome

CO 1 Explain the relevant parameter measurement.

CO 2 Perform tests and measurements using proper tools and technique.

CO 3 Demonstrate proper safety procedures in handling tools during measurement works.

CO 4

#### BVE1215

Solar PV Installation and Maintenance

Credit: 5

Prerequisites: None

#### Synopsis

This course will introduce students with terminologies used in photovoltaic (PV) system technology. It will enable student to assess, install and maintain solar PV system configuration for stand-alone and grid-connected power generation based on standard requirement by the agencies involved.

#### Course Outcome

CO 1 Apply the principles of solar PV system technology.

CO 2 Build PV system configuration.

CO 3 Demonstrate the awareness of standards and policies related to PV system in Malaysia.

CO 4

#### BVE1225

Switchboard Maintenance and Calibration

Credit: 5

Prerequisites: None

#### Synopsis

The course provide students with knowledge of the functions and operations of circuit breakers and switchboards as well as maintenance of switchboards and associated instruments and relays in order for safe operation of switchboard.

#### Course Outcome

CO 1 Ability to analyze basic principle of operation, construction and connections of a switchboard components and related equipments.

CO 2 Ability to demonstrate the calibration procedures on switchboard equipments using specific parameters.

CO 3 Ability to demonstrate proper safety procedures in maintenance work of switchboard equipment.

CO 4

#### BVE1233

Professional Practices

Credit: 3

Prerequisites: None

#### Synopsis

This course aims to explain the main concepts in engineering and technology ethics, risk management and occupational safety and health as well as to expose the students to basic of law in the engineering and technology context

#### Course Outcome

CO 1 Ability to ANALYSE hazards, the function of risk management and occupational safety and health (OSHA).

CO 2 Ability to APPLY the issues and challenges of engineering and technology ethics.

CO 3 Ability to PRACTICE the aspects and procedures of legal on engineering and technology issues.

CO 4

#### BVE2315

Building Electrical System Maintenance

Credit: 5

Prerequisites: None

#### Synopsis

Tools and Maintenance Tasks introduces and develops knowledge of basic building maintenance tools and materials, applied skills and techniques, industry health and safety standards, and preventive maintenance and troubleshooting practices in the building trades and facilities maintenance fields.

#### Course Outcome

CO 1 Describe safe practice of electrical systems used in buildings to perform common maintenance tasks.

CO 2 Demonstrate basic preventive and reactive maintenance procedures for residential homes, apartments, and appliances.

CO 3 Demonstrate an ethical awareness on safety and health while doing maintenance tasks.

CO 4

#### BVE2325

Renewable Energy System Maintenance

Credit: 5

Prerequisites: None

#### Synopsis

This course will introduce student to the renewable energy technology sources and sources, main characteristics and main components of the systems. The topics to be covered including Wind Energy, Solar

Energy , Hydropower and Fuel cell. Apart of the course implementation, there will be seminar organised related to these renewable energy technology (Industrial Talk).

#### Course Outcome

CO 1 Describe the fundamentals, main characteristics and main components of different renewable energy sources and systems.

CO 2 Demonstrate maintenance activities in a cost effective manner so that meet specific energy demands and have a minimal impact on the environment.

CO 3 Perform simple techno-economical assessments and compare environmental assessments of renewable energy systems

CO 4

#### BVE2335

Generator System Maintenance

Credit: 5

Prerequisites: None

#### Synopsis

This course consists of three learning section of diesel generator which are system operation, maintenance and service. Before going into the detailed system operation, students will be introduced with what is diesel generator and its function in electrical system. For maintenance section, students will be involved with strategy implemented in maintenance system which consists of preventive maintenance and condition based maintenance. Students also will be exposed to detailed servicing method of diesel generator which is related to fault diagnosis.

#### Course Outcome



CO 1 Demonstrate knowledge on generator system in term of governing, load sharing and synchronizing.

CO 2 Perform maintenance strategy for diesel generator system according to standard.

CO 3 Shares effect of generator operation and maintenance to the environment and human.

CO 4

#### BVE2415

Electrical Machine and Drive System Integration

Credit: 5

Prerequisites: None

#### Synopsis

This course is designed to introduce the student the principles of DC and AC motors drive control. This includes studying the concept of control modes for motor drives, connections and applications. The integration practices among PLC, microcontroller, motors, software, drives, computers, and other industrial equipment will be provided. Lectures and labs will place emphasis on the above items will allow the student to build a working integrated motor drive system throughout the semester.

#### Course Outcome

CO 1 Explain the concepts and techniques used in electrical machines drive system.

CO 2 Built control algorithm of programmable logic control (PLC), microcontroller, and Variable Frequency Drive (VFD).

CO 3 Follow safety regulation in handling electrical machine and drive integration equipment.

CO 4

#### BVE2425

Energy Efficiency Optimization

Credit: 5

Prerequisites: None

#### Synopsis

This course exposes the students to national and world economic perspectives on energy in term of economics, problems and current status of energy. In addition, safety aspect of electrical equipments will also be exposed to the student to create awareness and safe working practice. Through plans and operation for energy management and energy efficient equipments, student will learn on how efficient energy utilization can be achieved. At the end of this course, students will be exposed to the techniques for energy audit such as analyzing energy consumptions and identify a solution for energy saving programs.

#### Course Outcome

CO 1 Understand energy management, standards and safety aspect of efficient electrical energy utilization.

CO 2 Demonstrate the instrument and measurement tools of efficient electrical energy utilization.

CO 3 Demonstrate the compliance to the energy policies and legislation, Electrical Hazards and Safety while performing energy management related works.

CO 4

#### BVE2433

Collegiality Interaction and Management

Credit: 3

Prerequisites: None

#### Synopsis

The course provides a skill on how to develop and use the knowledge and skills

needed for effective professional collaboration, including team meetings, parent conferences, co-teaching, and problem solving with colleagues.

#### Course Outcome

CO 1 Prepare pedagogical aids including advance organizers

CO 2 Demonstrate managerial practice and application exercise

CO 3 Explains the role of systematic planning in solving problems.

CO 4

#### BVE2444

Technopreneur Project 1

Credit: 4

Prerequisites: None

#### Synopsis

Entrepreneurs need money to start and to grow their business. It is important to understand how revenue is generated, how to source for funds, how to control cash flow, how to assess the success of the company in monetary terms, and how to value a company for various purposes. The course exposes students to the various financial aspects relating to new ventures. These include approaches to secure start-up capital and venture financing. Students learn about the basic accounting, essential financial indicators, the types of funds available, the different categories of investors, the importance of intellectual property in securing finance, the financial details to be included in a business plan required for investment purpose, valuation of company and the art of negotiation with investors.

#### Course Outcome

CO 1 Apply various financial indicators & tools to prepare for financial information for a new business venture.

CO 2 Acquire skills to analyze financial statements.

CO 3 Display the art of negotiation with investors.

CO 4

#### BVE3515

Industrial Machinery Control System Design

Credit: 5

Prerequisites: None

#### Synopsis

One of the aspects of a good technologies is to have the capability of integrating the hardware and the software, thus an electrical technologies should be competence in programming. This course introduces basic programming using high level language (C language) includes study of PIC microcontroller architecture, its programming using C language and interfacing with input and output devices. These knowledge are gathered and applied to design microcontroller based system. Applying and analyse control system problems by utilizing control ler system such as P, PI, PID and Ziegler-nichols into water level & flow, temperature and servo motor. The course also to understanding of the PLC central processing unit, input-output system, programming and peripheral devices, and programming languages and will developed skills in programming PLC (Omron and Siemens) and applying in industrial PLC.

#### Course Outcome

CO 1 Ability to understand the PLC central processing unit, input-output system, programming and peripheral devices, and programming languages and will developed skills in programming PLC (Omron and Siemens) and applying in industrial PLC.

CO 2 Ability to analyse control system problems by utilizing control system such as P, PI, PID and Ziegler-nichols into water level & flow, temperature and servo motor.

CO 3 Ability to evaluate appropriate input and output devices for selected Microcontroller, Control System and Programmable Logic Control

CO 4

BVE3525

Monitoring System Integration

Credit: 5

Prerequisites: None

Synopsis

The course provides an introduction to the fundamentals of Supervisory Control And Data Acquisition (SCADA), the architecture, the componets, Human Machine Interface (HMI) and the applications of SCADA. Students also introduced to the concept of Internet of Things (IoT), network communications and the applications. Lectures and labs will place emphasis on the above items will allow the student to operate the monitoring system and make data analysis throughout the semester.

Course Outcome

CO 1 Apply the concept used in SCADA system development.

CO 2 Construct Human Machine Interface (HMI) in SCADA system and their the network communication.

CO 3 Demonstrate teamwork and leadership skills while doing group task.

CO 4

BVE3534

Industrial Data Analysis

Credit: 4

Prerequisites: None

Synopsis

The course provides an introduction to statistical analysis software to analyse industrial data.

Course Outcome

CO 1 Apply knowledge of data analysing technology.

CO 2 Evaluate statistical data technology using appropriate software.

CO 3 Demonstrate the importance of data analysis in industrial practice.

CO 4

BVE3544

Technopreneur Project 2

Credit: 4

Prerequisites: BVE2444

Synopsis

The start-up and growth of an enterprise invariably involves both human and financial capital. To manage the increasing pool of human resources and to convince venture capitalists to invest become two main issues especially for growing venture. This course consists of two parts: in the first part, organization and human resource management are introduced; in the second part, the focus is on writing a convincing business plan to attract venture capital investment. When enterprise starts to take shape and grow, more people will be hired, proper organization, team building and human resource management will become important issues. In this course, students will be exposed to the various organizational aspects relevant to new ventures and established companies. These include the pros and cons of the different organization structures, conflicts that may arise among employees, and approaches to building strong teams.

Human resource management techniques will also be introduced and discussed.

In the second part of the course, the business model canvas will be described listing the connections among the different components of a business. The value of a business plan and the techniques of writing a business plan will be introduced.

#### Course Outcome

CO 1 Make use of the business model canvas incorporating human and financial elements.

CO 2 Write a convincing business plan.

CO 3 Motivate all stakeholders and build a cohesive venture team.

CO 4

#### BVE3614

Maintenance Management System (MMS)

Credit: 4

Prerequisites: None

#### Synopsis

This course will introduce student to principle of maintenance management system. The topics to be covered including Introduction to Maintenance Management, Reliability performance of production plants, Total Productive Maintenance (TPM), Maintenance methods and techniques and Maintenance Software Application. Apart of the course implementation, there will be an industrial visit to related industries in order to expose student to the actual practices of maintenance management system.

#### Course Outcome

CO 1 Demonstrate knowledge on maintenance strategies used in industrial practices.

CO 2 Perform maintenance activities in a cost effective manner using appropriate software.

CO 3 Demonstrate the ability to works in group efficiently in diverse teams.

CO 4

#### BVE3624

Project Planning and Execution

Credit: 4

Prerequisites: None

#### Synopsis

The course provides an introduction to the key concepts of planning and executing projects that will identify a factors that lead to project success, and learn how to plan, analyze, and manage projects. Students will be exposed to various challenges to complete their projects.

#### Course Outcome

CO 1 Outline a project budget, control project plan and handle a technical work.

CO 2 Construct a complete project cycle include team building, project identification, scope, schedule and implement in a Gantt Chart.

CO 3 Demonstrate project planning and execution by using various information in order to produce a complete technical report.

CO 4

#### BVE3634

Final Year Project 1

Credit: 4

Prerequisites: None

#### Synopsis

This course is for fullfill students with knowledge in conducting research methods, particularly in the field of technical and vocational education in Malaysia. It is important in providing human capital development equivalent with global developments.

#### Course Outcome

CO 1 Identify issues or problems in industrial technology and propose solutions.

CO 2 Provides proposal for the implementation of Final Year Project.

CO 3 Presents ideas related to research to panel evaluators in more systematic.

CO 4

BVE3716

Final Year Project 2

Credit: 6

Prerequisites: BVE3634

#### Synopsis

This course is for fullfill students with knowledge in conducting research methods, particularly in the field of technical and vocational education in Malaysia. It is important in providing human capital development equivalent with global developments.

#### Course Outcome

CO 1 Identify issues or problems in industrial technology and propose solutions.

CO 2 Provides proposal for the implementation of Final Year Project.

CO 3 Presents ideas related to research to panel evaluators in more systematic.

CO 4

BVE4112

Industrial Training

Credit: 12

Prerequisites: Had taken all core courses from Year 1 to Year 3.

#### Synopsis

This course is to expose students about the real environment working in engineering

field. Understand the work culture in the industry and developing students technical and interpersonal skills as a preparation when serving in an educational institute .

#### Course Outcome

CO 1 Organizes productive work schedule.

CO 2 Display good practical skills in tools and equipment handling.

CO 3 Practices self discipline and responsibility attitude working in a team.

## CURRICULUM STRUCTURE BACHELOR OF TECHNOLOGY IN INDUSTRIAL ELECTRONICS AUTOMATION WITH HONOURS

YEAR	FIRST		SECOND		FIRST	SECOND	FIRST	SECOND	THIRD	THIRD	THIRD	FOURTH
	SEMESTER	FIRST	SEMESTER	SECOND								
		BV11112 Technology Skill and Development in Electronic Automation 1	BV11214 Technology Skill and Development in Electronic Automation 2	BV12112 Technology Data Acquisition and Analysis 1	BV12214 Technology Data Acquisition and Analysis 2	BV13114 Technology System Optimization 2	BV13215 System Integration Designing	BV13316 Final Year Project 2	BV14112 Industrial Training			
		BV11125 Product Development Technology	BV11222 Network, Switching and Routing	BV12125 Flexible Manufacturing System 2	BV12222 Technology System Optimization 1	BV13124 Technology System Optimization 2	BV13225 IoT and Analytics (Elective)					
		BV11135 Flexible Manufacturing System 1	BV11234 Technology System Programming 2	BV12135 Embedded System Programming Tool	BV12232 Application System Development 1	BV13134 Technology Quality Management	BV13234 Final Year Project 1					
		BV11142 Technology System Programming 1	BV11243 Professional Practices	BV12143 Network Security Implementation	BV12244 Technology Operation Management	BV13144 Capstone Technopreneur 2						
		UHC1012 Falsafah dan Isu Semasa	UHS1022 Soft Skills	UGE2002 Technopreneurship	BV12254 Capstone Technopreneur 1							
		UHL2422 Essential English	UHL2452 English for Vocational Purposes	UHF1111 Mandarin for Beginners	UHC2022 Penghayatan Etika dan Peradaban							
			UQA2002 Co-Curriculum		UHF2111 Mandarin for Intermediate							
<b>TOTAL CREDIT PER SEMESTER</b>	<b>18</b>	<b>19</b>	<b>18</b>	<b>19</b>	<b>16</b>	<b>14</b>	<b>6</b>	<b>12</b>				
<b>OVERALL TOTAL CREDIT FOR GRADUATION</b>	<b>122</b>											

### COURSES

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	To produce industrial electronic automation technologist that perform maintenance related work including automation maintenance, facility manager, and energy manager.
PEO2	To produce technopreneurs in electronic related technology.
PEO3	To produce relevant, respected and referred professionals in industrial electronic automation technology.

PROGRAMME OUTCOMES (PO)	
PO1	Apply knowledge of technology fundamentals to broadly-defined procedures processes, systems and methodologies in industrial electronic automation.
PO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems.
PO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in industrial electronic automation.
PO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	Demonstrate an awareness of management and technopreneurship practices in real perspective.
PO8	Demonstrate professionalism and social and ethical consideration.
PO9	Demonstrate leadership quality, mentoring and work effectively in diverse teams

## **COURSE SYNOPSIS**

### **BACHELOR OF TECHNOLOGY IN INDUSTRIAL ELECTRONIC AUTOMATION WITH HONOURS**

#### CORE FACULTY

BVI1112

Technology Skill and Development in Electronic Automation I

Credit: 2

Prerequisites: None

#### Synopsis

The aim of this course is to provide students with basic technical skills in electronic automation. This includes basic knowledge of technical drawing, software based drawing (AutoCAD), Print Circuit Board (PCB) Design and Programmable Logic Controller (PLC).

BVI1125

Product Development Technology

Credit: 5

Prerequisites: None

#### Synopsis

This course covers the operational behaviour of circuit components, including resistor, capacitor, inductor, diode, transistor up until integrated circuit (ICs). Important circuits, such as operational amplifier (op-amp) based circuits are also discussed and emphasized. An introduction to digital concept is also covered in this course.

BVI1135

Flexible Manufacturing System I

Credit: 5

Prerequisites: None

#### Synopsis

This course will be further advancement related to automation system and integration. The topics will cover on advanced PLC Programming (FBD, Structured Text, GrafCET etc), special motor for motion control (e.g. servo and

stepper motor), sensors and transducer (analogue sensor), mechanisms (e.g. gears, bearing, cam and follower, pulley, rack and pinion etc) as well electropneumatic and electrohydraulic system. As part of the FMS system, an industrial robotics will also be introduced in the last topic.

BVI1142

Technology System Programming I

Credit: 2

Prerequisites: None

#### Synopsis

This course delivers the competency to student in applying the fundamental programming concepts and able to analyse problem and produce the solution using algorithm development tools. Solve the problem using fundamental programming (C or C#) The course will be delivered using the basic programming language that is trending at the current market.

BVI1214

Technology Skill and Development in Electronic Automation II

Credit: 4

Prerequisites: BVI1112

#### Synopsis

This course aims to demystify the digital electronics through hands-on work in the lab creating simple machines with embodied behaviors. This course brings students over the beginner's threshold to a basic understanding of the use, terminology, and potential of digital electronic. The skills and concepts taught in this course are presented from an interdisciplinary approach which merges practices in sciences and technology.

BVI1222

Network, Switching and Routing

Credit: 2

Prerequisites: None

#### Synopsis



This course covers networking structure, and functions. The course introduces the principles and structure of IP addressing and the fundamentals of networks, switching and routing.

BVI1234  
Technology System Programming II  
Credit: 4  
Prerequisites: BVI1142

**Synopsis**  
This course deliver the competency to student in developing programs that can provide programmable solution using advance programming. The course will be delivered using the programming language that is trending at the current market. The student can also develop program to utilize the basic mobile input sensors and respond according to the problems.

BVI1243  
Professional Practices  
Credit: 3  
Prerequisites: None

**Synopsis**  
This course aims to explain the main concepts in engineering and technology ethics, risk management and occupational safety and health as well as to expose the students to basic of law in the engineering and technology context.

BVI2112  
Technology Data Acquisition and Analysis I  
Credit: 2  
Prerequisites: None

**Synopsis**  
This course covers the fundamental of electronic instrumentation. This includes the working principle and transduction properties of transducers and sensors. Importance and techniques of signal conditioning is emphasized. Element and principle of data conversion and acquisition and their applications are discussed.

BVI2125  
Flexible Manufacturing System II  
Credit: 5  
Prerequisites: BVI1135

**Synopsis**  
This course will introduce student to the Flexible Manufacturing System which mostly include of machine cell, consisting of a group of processing stations, interconnected by an automated material handling and storage system, and controlled by an integrated computer system.

BVI2135  
Embedded System Programming Tool  
Credit: 5  
Prerequisites: None

**Synopsis**  
This course emphasizes the role of microcontroller in an automation system. It covers input and output topics as well as memory usage. In addition, this course will also focus on how to program using language C. Meanwhile, the Raspberry Pi will be used as a controller.

BVI2143  
Network Security Implementation  
Credit: 3  
Prerequisites: None

**Synopsis**  
This course covers foundational understanding of cybersecurity and how it relates to information and network security. It provides core security skills needed for monitoring, detecting, investigating, analyzing and responding to security events, thus protecting systems and organizations from cybersecurity risks, threats and vulnerabilities.

BVI2214  
Technology Data Acquisition and Analysis II  
Credit: 4  
Prerequisites: BVI2112

**Synopsis**

This course covers data transfer, monitoring and control. This includes data transfer techniques using wired and wireless communication technology. Also introduced is development of mobile applications which allow data monitoring and data storage using mobile devices. In addition, elements of modern control systems are introduced. Control techniques of motors are included.

**BVI2222**

Technology System Optimization I

Credit: 2

Prerequisites: None

**Synopsis**

This course covers the fundamental of data communication network, measurement and instrumentation. This includes the working with current data network, measurement technique and network technology. System application, configuration and troubleshooting data communication network and electronic measurement is emphasized.

**BVI2232**

Application System Development I

Credit: 2

Prerequisites: None

**Synopsis**

This course provide a foundation in data management concepts and database systems. It includes representing information with the relational database model, manipulating data with an interactive query language (SQL), database development using standard Database Management System, and integration of database to application development.

**BVI2244**

Technology Operation Management

Credit: 4

Prerequisites: None

**Synopsis**

Technology Operation Management gives knowledge of concepts and principles for production and operations management in Electronic Industry Automation. This course emphasizes production functions, forecasting techniques, efficiency theory, layout techniques, economics order quantity level, control of source acquisition and project scheduling, and production standard must be comply. This course also provides knowledge and skills in planning, decision and control of production in the Electronic Industry Automation.

**BVI2254**

Capstone Technopreneur I

Credit: 4

Prerequisites: None

**Synopsis**

Entrepreneurs need money to start and to grow their business. It is important to understand how revenue is generated, how to source for funds, how to control cash flow, how to assess the succes of the company in monetary terms, and how to value a company for various purposes. The course exposes students to the various financial aspects relating to new ventures. These include approaches to secure start-up capital and venture financing. Students learn about the basic accounting, essential financial indicators, the types of funds available, the different categories of investors, the importance of intellectual property in securing finance, the financial details to be included in a business plan required for investment purpose, valuation of company and the art of negotiation with investors.

**BVI3114**

Technology System Optimization II

Credit: 4

Prerequisites: BVI2222

**Synopsis**

This course will introduce students to the fundamentals mobile application

development , embedded system development and intergration optimisation. The student will be introduce to method of development framework of mobile applications that can intergrate with embedded system application. Students will also be expected to conduct troubleshooting, testing and optimize the embedded system.

**BVI3124**  
Application System Development II  
Credit: 4  
Prerequisites: BVI2232

**Synopsis**  
This course focuses on the analysis and development of systems to meet the increasing need for information within organizations. It presents and analyzes various topics such as systems development life cycle, analysis and design techniques, software project planning, requirements collection and structuring, process modeling, data modeling, design of interface and data management, system design and implementation, and testing. It also emphasize on advanced database design techniques as well as implementation on cloud data storage.

**BVI3134**  
Technology Quality Management  
Credit: 4  
Prerequisites: None

**Synopsis**  
This course provides the understanding and knowledge of total quality principles and the use of quality tools to enable students to apply the principles of management, design and production in Electronic Industry Automation. This course covers the introduction to quality and the principles of total quality, its relationship to global competitiveness, ethics and culture in quality management, the 7 quality tools, quality function deployment, continuous improvements, benchmarking, ISO and the implementation aspects of total quality.

**BVI3144**  
Capstone Technopreneur II  
Credit: 4  
Prerequisites: BVI2254

**Synopsis**  
The start-up and growth of an enterprise invariably involves both human and financial capital. To manage the increasing pool of human resources and to convince venture capitalists to invest become two main issues especially for growing venture. This course consists of two parts: in the first part, organization and human resource management are introduced; in the second part, the focus is on writing a convincing business plan to attract venture capital investment. When enterprise starts to take shape and grow, more people will be hired, proper organization, team building and human resource management will become important issues. In this course, students will be exposed to the various organizational aspects relevant to new ventures and established companies. These include the pros and cons of the different organization structures, conflicts that may arise among employees, and approaches to building strong teams. Human resource management techniques will also be introduced and discussed. In the second part of the course, the business model canvas will be described listing the connections among the different components of a business. The value of a business plan and the techniques of writing a business plan will be introduced.

**BVI3215**  
System Integration Designing  
Credit: 5  
Prerequisites: None

**Synopsis**  
The aim of this course is to provide students with the technical knowledge and practical experience on Supervisory Control and Data Acquisition (SCADA) in automation technology. SCADA is a system of software and hardware elements

that allows industrial organizations to control industrial processes locally or at remote locations as well as monitoring, gathering, and process real-time data.

and interpersonal skills as a preparation when serving in an educational institute.

BVI3234  
Final Year Project I  
Credit: 4  
Prerequisites: None

**Synopsis**  
This course is for fullfill students with knowledge in projects development, particularly in the field of technical and vocational education in Malaysia. It is important in providing human capital development equivalent with global developments.

BVI3316  
Final Year Project II  
Credit: 6  
Prerequisites: BVI3234

**Synopsis**  
This course is for fullfill students with knowledge in conducting research methods, particularly in the field of technical and vocational education in Malaysia. It is important in providing human capital development equivalent with global developments. This course is the continuation of the the Final Year Project I. In this course, the students are required to develop a project to tackle an industrial problem. At the end of the semester, the students are required to produce a project report and present it to the faculty and industry evaluation panels.

BVI4112  
Industrial Training  
Credit: 12  
Prerequisites: None

**Synopsis**  
This course is to expose students about the real environment working in engineering field. Understand the work culture in the industry and developing students technical

## CURRICULUM STRUCTURE DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

YEAR	FIRST				SECOND		THIRD
SEMESTER	ZERO	FIRST	SECOND	FIRST	SECOND	FIRST	
COURSES	DUF1113 Physics	DRE1113 Circuit Analysis 1	DRE1123 Circuit Analysis 2	DRE2113 Electrical Power Systems	DRE2123 Electrical Machines	DRE3910 Industrial Training	
	UHL2442 Essential English	DRE1223 Digital Electronics	DRE1233 Electronic Devices	DRE2214 Microcontroller Programming and Interfacing	DRE2313 Control Systems		
	DUM1113 Basic Mathematics	DRE1213 Computer Programming	DRE1722 Electrical Computer Aided Design	DRE2**3 Elective 1	DRE2**3 Elective 2		
	UHC1012 Falsafah dan Isu Semasa	DRE1712 Measurement Technology	DRE1742 Electrical Installation	DRE2732 Programmable Logic Controller	DRE2712 Electro Pneumatic		
		UHL2412 English for Academic Communication	UHL2432 English for Professional Communication	DRE2112 Maintenance Technology	DRE2512 Occupational Safety and Health		
		UHS1022 Soft Skills	DUM1123 Calculus	DUM2143 Advanced Calculus	DRE2814 Final Year Project		
		UQA1002 Co-Curriculum	UHC2022 Penghayatan Etika dan Peradaban	UGE1002 Entrepreneurship			
TOTAL CREDIT	10	17	17	19	17	10	
TOTAL CREDIT FOR GRADUATION	90						

**ELECTIVE COURSES FOR  
DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING**

NO.	CODE	COURSE	CREDIT HOUR
<b>Elective 1</b>	DRE2413	Communication Systems	3
	DRE2213	Programming and Data Structure	3
	DRE2223	Sensor Technology	3
<b>Elective 2</b>	DRE2133	Power System Protection	3
	DRE2143	Power Electronics	3
	DRE2153	Renewable Energy Technology	3
<b>Total minimum credits of elective courses for graduation</b>			<b>6</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Graduates work in electrical & electronics engineering field as technical specialist.
PEO2	Graduates pursue their studies in technical & non-technical areas.
PEO3	Graduates demonstrate the commitment to the community and the professions.

**PROGRAMME OUTCOMES (PO)**

<b>PO1</b>	<b>Engineering Knowledge</b> Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation to wide practical procedures and practices.
<b>PO2</b>	<b>Problem Analysis</b> Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity.
<b>PO3</b>	<b>Design/Development of Solutions</b> Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
<b>PO4</b>	<b>Investigation</b> Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements.
<b>PO5</b>	<b>Modern Tool Usage</b> Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations.
<b>PO6</b>	<b>The Engineer and Society</b> Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well defined engineering problems.

<b>PO7</b>	<b>Environment and Sustainability</b> Understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts.
<b>PO8</b>	<b>Ethics</b> Understand and commit to professional ethics and responsibilities and norms of technician practice.
<b>PO9</b>	<b>Individual and Teamwork</b> Function effectively as an individual, and as a member in diverse technical teams.
<b>PO10</b>	<b>Communication</b> Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions.
<b>PO11</b>	<b>Project Management and Finance</b> Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environments.
<b>PO12</b>	<b>Lifelong Learning</b> Recognize the need for and have the ability to engage in independent updating in the context of specialised technical knowledge.

## COURSE SYNOPSIS

### DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

DRE1113 Circuit Analysis I

Credit : 3

#### Synopsis

This course introduces the basic concepts and engineering methods of DC circuit analysis. The contents include Ohm's Law, Kirchhoff's Law, series and parallel circuits, mesh and nodal analysis, superposition, source transformation, Thevenin's and Norton's theorem, and responses of first order circuits.

#### Course Outcomes

CO1 Attribute the basic concepts of electrical quantities by using basic circuit laws (Ohm's law and Kirchhoff's law) and simplification of resistive circuits.

CO2 Analyse DC circuit problems using circuit theorem, nodal analysis and mesh analysis.

CO3 Attribute the basic concepts of capacitance and inductance and analyse the characteristic of natural and step response in first order circuits.

CO4 Construct DC electric circuits to apply the concept of electrical quantities and verify circuit theorems.

CO5 Able to express ideas precisely, effectively and confidently, in written communication.

DRE1213 Computer Programming

Credit : 3

#### Synopsis

This course presents the C programming language for electrical and electronics engineer. The contents emphasis not only on the theoretical knowledge of programming but also the practical implementation in real-life situation. Students will learn structured program development, input and output, selection statement, repetitive statement, function,

array and pointer.

#### Course Outcomes

CO1 Identify the basic principles and concept of computer programming to solve the basic problem with utilization the knowledge of mathematics & sciences.

CO2 Apply control structure programming technique and develop a computer program using high level programming language to solve a problem.

CO3 Demonstrate a solution using computer programming tools for solving engineering problems.

CO4 Able to implement design thinking in developing solution.

DRE1223 Digital Electronics

Credit : 3

#### Synopsis

This course emphasizes on the fundamental of digital electronics. The student is first taught about the number system and logic gates before introducing them to digital IC technology. Then they are exposed to both combinational logic network and combinational MSI logic. In concurrence with this, the fundamental of sequential logic, flip-flop, counters and shift registers are taught.

#### Course Outcomes

CO1 Describe the principles of digital logic systems.

CO2 Analyse combitional logic system for Medium Scale Integrated (MSI) logic design.

CO3 Analyse and design sequential logic system for counters and registers.

CO4 Construct digital logic circuit.

CO5 Work in a team effectively.

DRE1712 Measurement Technology

Credit : 2

#### Synopsis

This course will introduce students to basic electronics circuit development, implementing basic measurements,



performing troubleshooting and calibration, and familiarizing the student with electronic instrumentation such as power supply, function generator, digital multimeter and oscilloscope.

#### Course Outcomes

CO1 Recognize and construct basic electronics components.

CO2 Construct and conduct measurement procedures using electronic measurement tools.

CO3 Able to perform troubleshooting procedure and apply calibration technique measurement verification.

#### DRE1124 Circuit Analysis 2

Credit : 3

#### Synopsis

This course provides the basic concepts and engineering methods of AC circuits. The contents include applications of Mesh and Nodal analysis, Superposition and Source Transformation Theorems, Thevenin and Norton Theorem. Resonant circuit, second order circuit and Balanced 3-phase circuits are also covered.

#### Course Outcomes

CO1 Understand the fundamental of AC circuit theory and analyze AC circuit problems by using nodal, mesh, Superposition, Source Transformation, Thevenin and Norton theorem.

CO2 Learn the AC power analysis in AC steady-state power calculations, power triangle, power factor correction and three phase system.

CO3 Discover the variation of RLC circuits in resonance and second-order circuit.

CO4 Construct the AC circuit analysis by using software or hardware.

CO5 Able to deliver oral presentation clearly and confidently according to the level of audience.

#### DRE1233 Electronics Devices

Credit : 3

#### Synopsis

This course introduces the students to the basic applications in electronic devices. This course is divided into 3 modules, namely: i) electronic components, ii) wave shaping and power supply, and iii) amplifier. The content covers the knowledge of electronics components such as diodes, rectifiers, capacitor as filters and transistors (BJT and FETs). Their basic operations in the applications are analyzed in DC and AC conditions.

#### Course Outcomes

CO1 Understand the function of electronic components in the operation of wave shaping, power supply and amplifier.

CO2 Understand the function of electronic components in the operation of wave shaping, power supply and amplifier.

CO3 Analyse the operating condition of transistor configurations in DC and AC condition and their frequency response.

CO4 Demonstrate the measurement of diode and transistor circuits.

CO5 Work effectively as individual, and as a member or leader in a team.

#### DRE1722 Electrical Computer Aided Design

Credit : 2

#### Synopsis

This course covers theoretical knowledge and practical-based on doing technical drawing by using mainly AutoCAD software. The course is focusing on the fundamental level of AutoCAD from scratch until the plotting technique. The students will be guided and exposed to technical drawing knowledge as well as electrical, electronic, geometrical and isometric drawing.

#### Course Outcomes

CO1 Apply the principles of technical drawing with utilization of knowledge of drawing and modifying techniques in

AutoCAD.

CO2 Construct electrical engineering schematic drawing using AutoCAD.

CO3 Sketch electronic circuit using AutoCAD software.

CO4 Practice usage of AutoCAD software in other engineering discipline.

DRE1742 Electrical Installation

Credit : 2

Synopsis

This course introduces students to the single phase and three phase wiring and installation. The students will learn about supply system, rules and regulation, wiring system and electrical protection system. They are also will practice in applying trunking and conduits for electrical wiring as well as doing fitting and installation of electrical system devices. Then, they will conduct inspection and testing on their wiring and installation as safety conformation and fulfil the regulations.

Course Outcomes

CO1 Interpret rules and regulation for electrical wiring comprising of cable selection and load calculation.

CO2 Perform inspection and testing in electrical installation.

CO3 Construct electrical wiring using suitable wiring tools and accessories.

CO4 Apply ethical principles and commit to professional ethics.

DRE2113 Electrical Power Systems

Credit : 3

Synopsis

This course introduces the fundamental of electrical power system which are the overview of power system, generation, transmission lines, distribution, representation of components, basic power system analysis.

Course Outcomes

CO1 Compute load factor, load demand

in distribution system and determine cost of electricity using the basic concept of electricity tariff and energy efficiency.

CO2 Develop the component representation of any balanced three phase power system using per-unit system and analyse the balanced fault system.

CO3 Analyse the performances of power transmission lines.

CO4 Apply and analyse the circuit of distribution and transmission systems.

CO5 Analyse the importance of electrical power system for sustainable development.

DRE2214 Microcontroller Programming and

Interfacing

Credit : 4

Synopsis

This course is designed to give the students a solid foundation in bare-metal firmware development using microcontroller. The goal of this course is to teach students how to navigate the microcontroller reference manual and datasheet to extract the right information to professionally build peripheral devices and firmware. To achieve this goal, no libraries are used, purely bare-metal embedded-c and register manipulations. By the end of this course, students will be able to configure microcontroller peripherals like GPIO, Display, Serial Communication and ADC.

Course Outcomes

CO1 Understand the concept of microcontroller architecture, flowchart and embedded C programming.

CO2 Develop a program and circuit to interface microcontroller with input output devices.

CO3 Develop a Program and circuit to interface microcontroller with display devices.

CO4 Demonstrate a solution using a microcontroller, display devices and analog sensors.

CO5 Proficient in using the relevant software and devices.

### DRE2732 Programmable Logic Controller Credit : 2

#### Synopsis

This course covered the fundamental of programmable logic controller (PLC) including input and output component, memory address, wiring diagram and design of ladder diagram for discrete and analog input/output (I/O) systems.

#### Course Outcomes

CO1 Explain the principles of programmable logic controller (PLC), the operation and types of PLC configuration, PLC wiring systems and the function of discrete and analog card.

CO2 Design ladder diagram of a control operating system for digital I/O systems using PLC programmer.

CO3 Design ladder diagram of a control operating system for analog I/O systems using PLC programmer.

CO4 Function effectively as an individual, and as a member in a team.

### DRE2112 Maintenance Technology Credit : 2

#### Synopsis

This course exposed students to the various maintenance strategies and current technologies available for solving maintenance problems in the industry. Besides, it also introduces students to many failure analysis techniques for finding solution to different maintenance problem. Maintenance solutions are discussed with the consideration of sustainable development in related issue using appropriate tools and techniques.

#### Course Outcomes

CO1 Explain and classify the different types of maintenance strategies, procedures and tools.

CO2 Analyse and find solution to maintenance problem using various failure analysis techniques.

CO3 Provide a sustainable planning and solution to the maintenance issues using appropriate tools and techniques.

### DRE2123 Electrical Machines Credit : 3

#### Synopsis

This course introduces the fundamental concepts and principles of various types of electrical machines. It is intended for students to understand fundamental aspects of rotating electrical machines. The first part of the course is a quick review of some electromagnetism fundamental while the following will deal with the different types of electrical machines. This course also exposes students to various types of three phase induction motor starter circuit. The students also will learn about the principle of electrical motor and its protection system.

#### Course Outcomes

CO1 Acquire fundamental principles, equivalent circuits, and operating conditions of the transformer and motors under steady state.

CO2 Analyze the parameters, equivalent circuits and operating conditions of the transformers and motors during steady state conditions.

CO3 Apply techniques to construct motor starter circuit and manipulate various type of tool and electrical accessories in motor starting circuit.

### DRE2313 Control Systems Credit : 3

#### Synopsis

This course introduces students to the control system technology, mathematical models of feedback systems. The students will be exposed to transient and steady-state analysis, root locus, and frequency response analysis.

#### Course Outcomes

CO1 Apply mathematical modelling technique to model plants in frequency domain using Laplace transform and block diagram representation.

CO2 Apply signal flow graph reduction method and Routh-Hurwitz criterion for system transfer functions.

CO3 Apply methods in control design including root locus, bode plot, and Ziegler-Nichols to achieve stability for control systems.

CO4 Utilize appropriate simulation software and tools related to control system application.

CO5 Work in a team effectively.

DRE2712 Electro Pneumatic

Credit : 2

#### Synopsis

This subject covers a general introduction to function and operation of pneumatic and electrical equipment used in electro pneumatics control including pneumatic supply, input elements, processing elements, control elements and working elements. The course deals with controlling of pneumatic actuators using electrical sensing and switching devices.

#### Course Outcomes

CO1 Interpret electro pneumatics components, symbols, circuit diagrams and motion diagrams.

CO2 Design pneumatic and electro pneumatic system for specific tasks to solve the given problem.

CO3 Construct and operate electro pneumatic circuits as per drawing.

CO4 Recognize the importance of the professional practice on the designed solution.

DRE2512 Occupational Safety and Health

Credit : 2

#### Synopsis

This course describes the processes of managing occupational safety and health

(OSH) matters in an organization. It introduces the Malaysian OSH Acts and Regulations, OSH Standards, OSH programs that need to be carried out to minimize hazards, risks, accidents and health effects among workers at workplace in the organization.

#### Course Outcomes

CO1 Apply the principles and system requirements of Occupational Safety and Health in organisation.

CO2 Evaluate Occupational Safety and Health management programs related to the hazards.

CO3 Perform the investigation on industrial accident.

CO4 Prepare safety management program to organisation.

DRE2814 Final Year Project

Credit : 4

#### Synopsis

This course aims to introduce students at entry level to problem solving and innovation in electrical engineering applications.

#### Course Outcomes

CO1 Identify and propose solution to engineering problem in electrical and electronics engineering project.

CO2 Relate the proposed project design to societal, health, safety, legal or cultural and their consequent responsibilities.

CO3 Demonstrate the impact of electrical and electronics engineering projects into sustainability development.

CO4 Apply the engineering code of ethics in electrical and electronics engineering projects.

CO5 Work in a team effectively as a leader or a team member.

DRE3910 Industrial Training

Credit : 10

#### Synopsis

In industrial training the students should gain insight into industrial practice, in order to visualize the tasks and possibilities of their later occupation work. All students are required to undergo an industrial training for a certain period that has been agreed by the faculty during last semester of the academic year. The performance of each student during the periods of his/her industrial training is evaluated by the faculty staff, and the representatives from employer organization.

#### Course Outcomes

CO1 Identify in-depth the industrial organization, structure, operation, production and utilize engineering knowledge to identify and analyse problem and then, provide the engineering solution.  
 CO2 Response and comply with the importance of society, environment and sustainability in engineering practices, decisions, and solutions.  
 CO3 Practice the professionalism and work etiquette that comply to be a good and responsible engineer.  
 CO4 Demonstrate communication and management/leadership skills to lead or manage effectively in an industrial environment.  
 CO5 Demonstrate the knowledge and ability to search and retrieve information and materials related to the industrial needs.  
 CO6 Demonstrate the knowledge and ability to conduct the given industrial activities and project.

#### Elective Courses:

DRE2413 Communication Systems  
 Credit : 3

#### Synopsis

This course introduces the fundamentals of communication systems emphasizing theory, concepts and industrial applications. It discusses the analog and digital modulation techniques that are used nowadays. This includes the amplitude modulation (AM) and frequency modulation

(FM). Digital modulation techniques such as pulse code modulation, delta modulation and including shift keying are also discussed. Various sampling, quantization process and line coding are also introduced in this course. The system performance due to the presence of noise is also presented.

#### Course Outcomes

CO1 Describe the basic principle of communication system.  
 CO2 Demonstrate the analog and digital modulation techniques in communication system.  
 CO3 Apply the principle knowledge to practical applications in telecommunication.  
 CO4 Understand the application and its affect in environment of various communication systems.

DRE2213 Programming and Data Structure  
 Credit : 3

#### Synopsis

The Raspberry Pi single board computer (SBC) capable of running Linux and a whole host of applications. Python is a beginner-friendly programming language, used in web development, scientific research, and in any other industries. This subject will introduce student in writing their own programs with Python. They will be exposed to write coding to blink lights, respond to button pushes, read sensors, and log data on the Raspberry Pi.

#### Course Outcomes

CO1 Understand the basic configuration steps for Raspberry Pi installation.  
 CO2 Construct basic computer program using the Python programming language to solve problem.  
 CO3 Develop a workable Python program using an appropriate control structure technique and suitable hardware implementation.  
 CO4 Demonstrate design thinking skill

for the computer programming solution.

DRE2223 Sensor Technology  
Credit : 3

#### Synopsis

This course introduces the students to the working principles of different sensors commonly used in industrial applications. These include resistive based sensor, capacitive based sensor, inductive based sensor, strain gauge, piezoelectric sensor and optical based sensor. The knowledge from this course will be addressed and applied by the students to demonstrate their understanding via laboratory and project demonstration at the end of the course.

#### Course Outcomes

- CO1 Analyze the principles and operation of how different sensors work.
- CO2 Evaluate different type of sensors and modalities are appropriate for different applications.
- CO3 Conduct various measurements using different types of sensors and with the support of appropriate interface system.
- CO4 Demonstrate the requirement and consideration in sensor selection for detection and monitoring in engineering technology applications.

DRE2133 Power System Protection  
Credit : 3

#### Synopsis

This course introduces the fundamental of power system protection. The intentions are to expose the students to type of protection system used in industry. This course introduces an overview of protection system, protective devices and relays, protection of network elements, fault analysis and discrimination/coordination study.

#### Course Outcomes

- CO1 Explain the overview of the protection system and roles of the equipment which includes switches, fuses, circuit breakers, isolators, relays, control panels, current & potential transformers and various associated equipment inside the power system.
- CO2 Determine the type of faults and abnormal conditions occurring inside the power system.
- CO3 Analyze the performance of the protection component inside the system by performing fault analysis using per-unit (P.U) system.
- CO4 Analyze the capability of the protection system by performing discrimination/ coordination study accordance to the IEC standard.
- CO5 Understand the consequence of the power system protection to prevent system stability losses and minimize the damage to the associated equipment and end users.

DRE2143 Power Electronics  
Credit : 3

#### Synopsis

The course exposes the students a foundation of knowledge, understanding and analysis of power electronics circuits for energy conversion. Student will use the fundamental analysis tools, practical consideration for simulation process and a range of power electronics applications. Practical experiments and trouble shooting in the laboratory will also be conducted.

#### Course Outcomes

- CO1 Explain switching characteristics, operating principles, advantages and disadvantages of basic power electronics technologies.
- CO2 Construct the power electronics topologies for each energy conversion circuit.
- CO3 Analyze the power electronics topologies for each energy conversion circuit.

DRE2153 Renewable Energy Technology

Credit : 3

### Synopsis

This course introduces students to the alternative energy theories and concepts of some components and energy utilization in electric power system industries. It covers energy conversion, utilization and storage system for renewable technologies such as solar, wind, biomass, fuel cell, wave and etc. This course emphasis on fundamental of photovoltaic (PV) systems. It also touches upon the environmental consequences of energy conversion and how alternative energy can reduce pollution and global climate change.

### Course Outcomes

CO1 Describe fundamental and characteristics of renewable energy resources.

CO2 Analyze performance of renewable energy system and its components under certain condition.

CO3 Measure, determine and analyze data from various systems based on required design.

CO4 Apply common standards in designing the structure of renewable energy system.







# FACULTY OF COMPUTING

COURSE INFORMATION 2022-2023

**CURRICULUM STRUCTURE  
BACHELOR OF COMPUTER SCIENCE (COMPUTER SYSTEMS & NETWORKING) WITH HONOURS**

YEAR SEM	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
	UHS1022 Soft Skills	UHC2022 Penghayatan Etika dan Peradaban	UHF1**1 Foreign Language Level 1	BCS2173 Human Computer Interaction	UHL2432 English for Professional Communication	UHF2***1 Foreign Language Level 2	BC****3 Elective II	BCC4012 Industrial Training
	UHC1012 Falsafah dan Isu Semasa	AQA2002 Ko-Kurikulum	UGE2002 Technopreneurship	BCI3283 Mobile Application Development	BCI2313 Algorithm & Complexity	BCI3302 Project Management & Professional Practice	BC****3 Elective III	
	UHL2400 Fundamental of English Language	UHL2412 English for Academic Communication	UHL2422 English for Technical Communication	BCS2323 Artificial Intelligence Techniques	BUM2413 Applied Statistics	BCN2033 Information Security	BCN3053 Distributed & Parallel Computing	
	BUM1153 Intermediate Mathematics	BCI1093 Data Structure & Algorithms	BCI2323 Web Development	BCN2083 Computer Networks	BCN3263 Wireless Network	BCN3323 Network Design and Management	BCC3024 Undergraduate Project II	
	BCI1203 Programming Techniques	BCI2023 Database Systems	BCS2163 Object- Oriented Design & Implementation	BCN3033 Network Programming	BCN3173 Embedded System Application Design	BC****3 Elective 1		
	BCN1043 Computer Architecture & Organization	BCN2053 Operating Systems	BUM1233 Discrete Mathematics and Applications		BCN3043 Network Service Administration	BCC3013 Undergraduate Project I		
	BCS1043 Software Engineering	BCN1053 Data Communication & Networking	BCN2193 Network Technologies					
	BCN1063 Structured Network Cabling							
<b>TOTAL CREDIT</b>	<b>19</b>	<b>18</b>	<b>17</b>	<b>15</b>	<b>17</b>	<b>15</b>	<b>13</b>	<b>12</b>
<b>TOTAL CREDIT FOR GRADUATION</b>	<b>126</b>							

**ELECTIVE COURSES TO BE OFFERED FOR BACHELOR OF  
COMPUTER SCIENCE (COMPUTER SYSTEMS & NETWORKING) WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BCN3233	Cybercrime and Forensic Computing	3
2	BCN3113	Ethical Hacking	3
3	BCN3223	Cryptography	3
4	BCS3433	Software Architecture for Autonomous Systems	3
5	BCS3423	Integrated Business Process With SAP	3
6	BCS3453	Integrated Application Development Framework	3
7	BCS3443	Cyber Physical System Modelling and Design	3
8	BCM3253	Data Analytics and Visualization	3
9	BCM3263	Augmented Reality	3
10	BCI3293	Emerging Technology	3
11	BCI3313	IoT Data Integration	3
12	BCI3323	IoT Application	3
13	BCN3343	Integrated System and Sensor Application	3

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	<p><b>Competent</b> Competent ICT professionals who adopt an attitude of professionalism and contribute to the digitization agenda in organization, entrepreneurship or community across various fields.</p>
PEO2	<p><b>Adaptability</b> ICT professionals who are capable to enhance competencies, leadership and personal development for career advancement and in turn contribute to the development of the country.</p>
PEO3	<p><b>Leadership</b> ICT professionals who are committed to their careers and community, and responsibly contributing to the perfection of society.</p>

**PROGRAMME LEARNING OUTCOMES (PLO)**

PLO1	Demonstrate knowledge and understanding of the theory and principles of Computer Science specializing in Computer Systems & Networking (Knowledge and Understanding)
PLO2	Demonstrate knowledge and understanding of the theory and principles of Computer Science specializing in Computer Systems & Networking (Cognitive Skills)
PLO3	Apply appropriate techniques, skills and tools in computer science practices specializing in Computer Systems & Networking to understanding the body of knowledge and/or solve a problem. (Practical Skills)
PLO4	Demonstrate the ability to possess relationships and collaborative skills in managing relationships in teams and within the organizations (Interpersonal)

	Skills)
PLO5	Communicate clearly and effectively to convey ideas in written and oral form, confidently, accurately and coherently using appropriate context and language. (Communication Skills)
PLO6	Choose/use appropriate technology to support/solve the problem at hands (Digital Skills)
PLO7	Apply mathematical and other quantitative, qualitative tools to analyze and evaluate numerical & graphical / visual data for solving problem in the real context. (Numerical Skills)
PLO8	Demonstrate autonomous leadership skill to the assigned responsibilities in a team. (Leadership, Autonomy and Responsibility)
PLO9	Student possess the ability to manage themselves effectively and engage effectively in self-directed lifelong learning for achieving self-sustainability, competitiveness and employability. (Personal Skills)
PLO10	Demonstrate entrepreneurial thinking and innovational thinking within the field of computer science (Entrepreneurship Skills)
PLO11	Demonstrate ethical behavior and act professionally within the varied environment and practice. (Ethics and Professionalism)

**COURSE SYNOPSIS****BCN1043  
COMPUTER ARCHITECTURE &  
ORGANIZATION**

Credit Hour: 3

Prerequisite: None

## Synopsis:

This course discusses the component, structure and function of a computer. It exposes student with the architecture and organization of a computer. This subject covers on the numbering system, data representation, the internal and external computer communication through system buses and Input/Output, computer storage, internal architecture of Central Processing Unit, Logic Gates and Boolean Algebra. Assembly languages are expose to student for better understanding of the computer structure and its component.

## Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the theory and principles of computer architecture and organization (C2, PLO1);

CO2: Classify the internal and external components of a computer structure and its functionality which include CPU, buses, memory and I/O. Explain how the components of a computer architecture and organization contribute to the computer performance. (C3, PLO2);

CO3: Differentiate the different machine data level representation by writing assembly language code to show computer inner working behavior. (P3, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Demonstrate arithmetic application on number system and performance metrics. (C3, PLO7).

**BCI1203  
PROGRAMMING TECHNIQUES**

Credit Hour: 3

Prerequisite: None

## Synopsis:

This course discusses on understanding problems and translating them into computer solution techniques using programming language. This course enables students to apply programming techniques, write programming codes from given problems and execute programming codes successfully.

## Course Outcome:

By the end of semester, students should be able to:

CO1: Describe the fundamental concept of programming techniques (C2, PLO1);

CO2: Demonstrate appropriate programming techniques in solving a given problem. (C3, PLO2);

CO3: Construct syntax error-free programs. (P3, PLO3);

CO4: Produce programming technique's solutions using appropriate digital tools and/or platforms. (A3, PLO6);

CO5: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5).

**BCN2053  
OPERATING SYSTEMS**

Credit Hour: 3

Prerequisite: None

## Synopsis:

This subject introduces the various data and control structures necessary for the design and implementation of modern computer operating systems. Memory, Processor, Concurrent, File, Device and Network Management are explored as the basic of all Operating Systems.

## Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the theory and principles of operating systems (C2, PLO1);

CO2: Distinguish the relationship between OS and hardware which includes User command interface, Memory Management, Processor

Management, File Management, Device Management & Network Management (C3, PLO2);  
CO3: Construct OS instructions via Command line and Shell Scripting (P3, PLO3);  
CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);  
CO5: Manage relevant information from different sources related to the operating systems (A3, PLO6).

### **BCN1053**

#### **DATA COMMUNICATION & NETWORKING**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. It uses the OSI and TCP layered models to examine the nature and roles of protocols and services at the application, network, data link, and physical layers. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum.

#### Course Outcome:

By the end of semester, students should be able to:

- CO1: Demonstrate understanding of basics computer networking (C2, PLO1);
- CO2: Analyze process by identifying the problems in data communication. (C4, PLO2);
- CO3: Construct a simple LAN topology by applying basic principles of cabling using network simulation and follow basic configuration of network design using real network devices such as switches and routers (P3, PLO3);
- CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);
- CO5: Perform standard configuration and troubleshooting network independently (A3, PLO9),

### **BCS1043**

### **SOFTWARE ENGINEERING**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course presents an introduction to software engineering concepts including: software engineering paradigms, requirements specification, design, software verification and validation; software evolution and reliability. This course also describes the concepts and methods of information system analysis and design (structured approach), with an emphasis on system analysis methods and tools.

#### Course Outcome:

By the end of semester, students should be able to:

- CO1: Distinguish the important terminology and activities involves (theoretically and practically) related to foundation concepts of software engineering and software development (C2, PLO1);
- CO2: Show system design solutions (structured design approach) from a case study that comply with the stages of systems development life cycle (C3, PLO2);
- CO3: Show technical solutions to a range of audience and reproduce a system design (structured design approach) from a case study that comply with the stages of systems development life cycle (P3, PLO3);
- CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5);
- CO5: Display an ethical and professional values in carrying out the given tasks (A3, PLO11).

### **BCI2023**

#### **DATABASE SYSTEMS**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

The course emphasizes on the importance of data to an organization and how the data should be managed. Database management system (DBMS) will be viewed as a solution to the problems of file processing system.

Aspects of relational database design will be covered in details. This includes database development life cycle, database architecture, data models, and normalization process. Structured Query Language (SQL) will be discussed and emphasized as query language in database management. Students will be given a real life problem to design and develop a database application system. In the later part of the course students will be exposed to the latest developments in database architecture.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate knowledge and understanding of the concepts, principles and applications of database systems. (C2, PLO1);

CO2: Manipulate queries using the syntax of Structure Query Language (SQL) (P4, PLO3);

CO3: Construct innovative solution through the representation of data model using ER and EER diagrams and normalize database to be implemented in database application system using SQL (C4, PLO2);

CO4: Demonstrate personal skills effectively through the punctuality and completeness of assessment submissions. (A4, PLO9);

CO5: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

### **BCI1093 DATA STRUCTURE &ALGORITHMS**

Credit Hour: 3

Prerequisite: BCI1203 PROGRAMMING TECHNIQUES

Synopsis:

This course is designed to expose the students to the data structures and algorithm. It provides theoretical basis in data structures and the application of data structures is based on standard algorithms. Students must also be able to transform the data structure and algorithms problems into the computer programs.

Course Outcome:

By the end of semester, students should be able to:

CO1: Describe the concept of data structures and algorithms. (C2, PLO1);

CO2: Analyze various types of data structures and algorithms techniques in solving a related problem. (C4, PLO2);

CO3: Construct a program by applying the data structure and algorithms techniques for a related problem. (P3, PLO3);

CO4: Communicate effectively in both written and oral forms via appropriate medium and language (A3, PLO5);

CO5: Use digital skills to find solution for a related problem (A3, PLO6).

### **BCI2313 ALGORITHMS AND COMPLEXITY**

Credit Hour: 3

Prerequisite: BCI1093 DATA STRUCTURE & ALGORITHMS

Synopsis:

This course covers advanced algorithms in sorting, graph theory, algorithm complexity analysis, finite state machine, regular expression and halting problem. Student will be able to analyze and evaluate the algorithms through given assessments that based on a related case study. to advanced techniques for the design and analysis of algorithms and explores variety of applications.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate basic complexity analysis to get the algorithm complexity. (C2, PLO1);

CO2: Analyze various types of algorithm techniques in solving the related problems. (C4, PLO2);

CO3: Construct a solution by applying appropriate algorithms or techniques for the related problems. (P4, PLO3);

CO4: Apply numerical knowledge which is mathematical notation to the models of computation. (C4, PLO7);

CO5: Communicate clearly and effectively to convey ideas in written and oral form. (A4, PLO5).

### **BCS2163 OBJECT ORIENTED DESIGN AND IMPLEMENTATION**

Credit Hour: 3

Prerequisite: BCI1203 Programming  
Techniques

#### Synopsis:

This course introduces students to object-oriented design principles and their application using one object-oriented language. Students will also learn how to use standard notation to illustrate their designs.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Describe the concept of object-oriented design in object-oriented program. (C2, PLO1);

CO2: Construct object-oriented designs and describe these designs using standard software engineering notations. (C4, PLO2);

CO3: Demonstrate the ability to implement object-oriented designs in an object-oriented programming language. (P4, CLO3);

CO4: Work with available software engineering tools to manage artifacts created during the development process and programming language tools to develop object-oriented applications. (A3, PLO4);

CO5: Practice clear and effective communication to convey ideas in written and oral form using appropriate context and language. (A3, PLO5).

### **BCS2313 ARTIFICIAL INTELLIGENCE TECHNIQUES**

Credit Hour: 3

Prerequisite: BCI1093 DATA STRUCTURE &  
ALGORITHMS

#### Synopsis:

This course introduces student to the theory and practice of the Artificial Intelligence (AI). Student are expose to the main artificial intelligence topics including the fundamental issues, search strategies, knowledge representation and reasoning, advanced search, agents, machine learning and robotics. Practical examples of how artificial

intelligence is applied to commercial, scientific and consumer applications will be covered.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish the intelligent system concepts and methodologies in computer science. (C2, PLO1);

CO2: Demonstrate critical thinking ideas in intelligent system knowledge and problem-solving. (C4, PLO2);

CO3: Construct solution using intelligent system knowledge and problem solving. (P4, PLO3);

CO4: Apply numerical knowledge to the intelligent system solution. (C3, PLO7);

CO5: Communicate clearly, confidently, accurately, coherently and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5)

### **BCN2033 INFORMATION SECURITY**

Credit Hour: 3

Prerequisite: BCN1053 DATA  
COMMUNICATION & NETWORKING

#### Synopsis:

The course introduces the fundamentals of information security providing information security basics, purposes, various types of security attacks, implementation and discussion in the aspect of security. Topics include: foundational concepts in security, principles of secure design, threats and attacks, basics of cryptography, network securing, intrusion detection and prevention systems.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Understand the fundamentals of security and factors driving the need for information security (C2, PLO1);

CO2: Analyze theory and principles of information security, types of security threats, potential attacks, cryptography, firewalls, and intrusion detection systems (C4, PLO2);

CO3: Construct attack and defense methods into computer and network environments (P4,



PLO3);  
 CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A4, PLO5);  
 CO5: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice in the context of information security A4, PLO11).

### **BCS2173 HUMAN COMPUTER INTERACTION**

Credit Hour: 3

Prerequisite: BCS1043 SOFTWARE ENGINEERING

#### Synopsis:

This course provides an introduction to Human-Computer Interaction (HCI). HCI is concerned with understanding, designing, implementing and evaluating user-interaction with the computers so that the designers can maximize user interaction (UI) and user experience (UX). On completing this course, the students will have knowledge of the theoretical foundations of designing the interaction between humans and computers. They will also have practical experience in implementing and evaluating the interaction.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Explain theory and principles of Human Computer Interaction (C2, PLO1);

CO2: Distinguish intellectual independence in the application of knowledge in Human Computer Interaction field by applying critical, analytical and evaluation skills in solving the related problems (C4, PLO2);

CO3: Construct solution by applying appropriate techniques, skills and tools in Human Computer Interaction to solve the related problem (P4, PLO3);

CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5);

CO5: Show the ability to possess relationships and collaborative skills in managing relationships in teams (A3, PLO4).

### **BCI3302 PROJECT MANAGEMENT & PROFESSIONAL PRACTICES**

Credit Hours: 3

Prerequisite: None

#### Synopsis:

This course exposes the student with step by step project management process inclusive of project planning, evaluation, estimation, resource allocation, monitoring and control and managing people and teams to bring about the successful completion of specific project goals and objectives. Further, the professional practice in IT and entrepreneurship elements will be introduced where the student is expected to demonstrate the professional ethic and entrepreneurship traits in his/her group projects.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish appropriately the concepts and principles of Project Management and Professional Practice. (C2, PLO1);

CO2: Construct a practical software project management plan and report based on Professional Practice (C4, PLO2);

CO3: Use appropriate software management application/tools in software project management case study. (P4, PLO3);

CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A5, PLO5);

CO5: Demonstrate the element of entrepreneurship in project report (A5, PLO10).

### **BCI3283 MOBILE APPLICATION DEVELOPMENT**

Credit Hours: 3

Prerequisite: BCS2163 OBJECT ORIENTED DESIGN & IMPLEMENTATION

#### Synopsis:

This course is concerned with the development of applications on mobile and wireless computing platforms. It explores mobile application development aspects with

emphasis on the relationship between theoretical and its practical application using cases and real examples of mobile applications. Emphasis is placed on the process, tools and frameworks required to develop applications for current and emerging mobile computing devices.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish appropriately the concepts and principles of mobile application development. (C2, PLO1);

CO2: Analyze the limitations and challenges in mobile applications. (C4, PLO2);

CO3: Construct a mobile application using selected software development environment. (P4, PLO3);

CO4: Demonstrate the element of entrepreneurship in project report. (A4, PLO10);

CO5: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

### **BCI2323 WEB PROGRAMMING**

Credit Hours: 3

Prerequisite: BCI1203 PROGRAMMING TECHNIQUES, BCI2023 DATABASE SYSTEMS.

#### Synopsis:

This course introduces the essential topics of Internet programming & development of web-based applications. Students will be able to develop a dynamic web-based application by using server and client side scripting.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish the fundamentals of dynamic web based applications. (C2, PLO1);

CO2: Demonstrate thinking skills to solve specific problems with web based applications. (C4, PLO2);

CO3: Construct a web based application prototype using HTML, web server, database

and scripting language. (P4, PLO3);

CO4: Demonstrate communication effectively in written and oral form through report and presentation session. (A4, PLO5);

CO5: Demonstrate leadership skills in resources and tasks management. (A4, PLO8).

### **BUM1233 DISCRETE MATHEMATICS AND APPLICATIONS**

Credit Hours: 3

Prerequisite: None

#### Synopsis:

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focusing on providing a basic theoretical foundation for further work. Students are exposed to logic and proof techniques, set theory, elementary number of theory, functions and relations, graph, trees, modelling computations and abstract algebra. This course integrates symbolic tools, graphical concepts, and numerical calculations.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of discrete mathematics. (C2, PLO1);

CO2: Analyze mathematical problem using discrete mathematics. (C4, PLO2);

CO3: Provide solution to discrete mathematics problems arise from computer science and engineering field. (C5, PLO2).

### **BUM2413 APPLIED STATISTICS**

Credit Hours: 3

Prerequisite: None

#### Synopsis:

This course discusses on statistical problem solving methodology and descriptive statistics; sampling distribution and confidence interval; hypothesis testing; analysis of variance (ANOVA); goodness-of-fit test and contingency tables; regression and correlation including simple and multiple linear

regressions. Microsoft Excel software will be used in this course as a statistical package (other statistical packages are SPSS, R Language, S Plus, EViews and Minitab shall be used in this course).

Course Outcome:

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of statistics. (C3, PLO1);

CO2: Perform statistical analysis by using appropriate statistical theory and methodology. (C4, PLO2);

CO3: Analyze real life to solve related problem in various disciplines. (C4, PLO2).

### **BUM1153 INTERMEDIATE MATHEMATICS**

Credit Hours: 3

Prerequisite: None

Synopsis:

This course introduces and discusses the fundamental of mathematics focusing on providing a solid theoretical foundation for further work. Student are exposed to number system, equations, inequalities and absolute value, polynomials, sequences and series, matrices and system of linear equations, functions and graphs, and trigonometric functions. This course also integrates symbolic tools, graphical concepts, and numerical calculations.

Course Outcome:

By the end of semester, students should be able to:

CO1: Acquire the fundamental principles of basic mathematics (C3, PLO1);

CO2: Apply the appropriate method to solve mathematical problems (C4, PLO2).

### **BCN2083 COMPUTER NETWORK**

Credit Hour: 3

Prerequisite: BCN2193 NETWORK TECHNOLOGIES

Synopsis:

The primary focus of this course is on LAN redundancy and dynamic routing. This course focuses on switching and routing protocols and concepts used to improve redundancy, propagate information, and secure the portion of the network where most users access network services. Switching technologies are relatively straightforward to implement; however, as with routing, the underlying protocols and algorithms are often quite complicated. This course will go to great lengths to explain the underlying processes of the common Layer 2 and layer 3 technologies.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the theory and principles LAN redundancy and dynamic routing (C2, PLO1);

CO2: Analyze communicates between switches and routers in a small or medium sized business network to implement LANs and routing protocol. (C4, PLO2);

CO3: Organize the configuration, verification, and troubleshooting LANs and WANs. (P3, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Apply professional practice by troubleshoot enterprise network problems (A3, PLO11).

### **BCN3063 DISTRIBUTED AND PARELLEL COMPUTING**

Credit Hour: 3

Prerequisite: BCN2053 OPERATING SYSTEMS, BCN1053 DATA COMMUNICATION & NETWORKING

Synopsis:

This course is intended to introduce and motivate the study of high performance computer systems and algorithms. The student will be presented with the foundational concepts pertaining to the different types and classes of high performance computers. The students shall learn advanced computer architectures, organization, and design, and also the basics of parallel programming i.e.,

algorithm design and analysis. Software is no longer sequential. Many programs are now concurrent, parallel, distributed or mobile. This module explores technologies that enable, the design issues that concern, and the hierarchy of architectures that deliver, distributed and parallel systems.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the theory and principles in distributed and parallel computing (C2, PLO1);

CO2: Analyze distributed and parallel computing technical challenges and current issues the systems design (C4, PLO2);

CO3: Design and implement distributed and parallel programs to solve specified problems. (P4, PLO3);

CO4 Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO);

CO5: Collaborate in team to organize new idea, solving problems related to distributed and parallel computing. (A3, PLO9).

**BCN3323**

**NETWORK DESIGN AND MANAGEMENT**

Credit Hour: 3

Prerequisite: BCN1053 DATA COMMUNICATION & NETWORKING

**Synopsis:**

This course focuses on designing, analyzing and management of networks that are reliable, secure and manageable. Student will learn a practical means of designing or evaluating a network management system for particular networking environment. These includes top-down network design methodology where students learn how to analyze end user business and technical requirements before designing networks that meets the requirement based on the best practices. Lastly, student will learn how to analyze and manage the networks by using relevant network management tools.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Demonstrate understanding in principle of network design, analysis and management (C2, PLO1);

CO2: Analyze computer networks, formulate problems and provide technical solutions to improve quality of service (C4, PLO2);

CO3: Construct logical and physical network based on requirement and best practices (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Collaborate in team to organize new idea, solving problems related to network designing principle. (A3, PLO9).

**BCN3033**

**NETWORK PROGRAMMING**

Credit Hour: 3

Prerequisite: BCN1053 DATA COMMUNICATION & NETWORKING, BC11203 PROGRAMMING TECHNIQUES.

**Synopsis:**

This course will introduce the basic principles of network programming, such as socket programming (client and server side), developing client-server application, secure socket, and so on. It will provide students with an understanding of TCP/IP network programming. In particular, this course focuses on the understanding of network concepts, principles, and techniques in details and how to program them using a programming language.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the programming language and technique in relation to the networking concept (C2, PLO1);

CO2: Analyze the programming language in network point of view (C4, PLO2);

CO3: Construct syntax error-free programming codes for network programming (P4, PLO4);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Collaborate in team to organize new idea, solving problems related to network

programming. (A3, PLO9).

**BCN3032**  
**NETWORK SERVICES ADMINISTRATION**

Credit Hour: 3

Prerequisite: None

Synopsis:

This course is designated to expose the student to an introduction of the server and its associated technologies. The student will learn about the domain name system, dynamic host configuration protocol, and how to configure secure network access as well as implement fault-tolerant storage technologies. Other than that, the student will understand the network technologies most commonly used and IP-enabled network, and how to secure servers and maintain update compliance.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the principles and fundamentals of server technology (C2, PLO1);

CO2: Analyze the services that are supported by the server technology (C4, PLO2);

CO3: Organize the installation and the configuration for the servers and clients' applications. (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Collaborate in team to organize new idea, solving problems related to server technology. (A3, PLO9).

**BCN2193**  
**NETWORK TECHNOLOGIES**

Credit Hour: 3

Prerequisite: BCN1053 DATA COMMUNICATION & NETWORKING

Synopsis:

This course describes the architecture, components, and operations of routers and switches in a small network. Students learn

how to configure a router and a switch for basic functionality. By the end of this course, students will be able to configure and troubleshoot routers and switches and resolve common issues with RIPv1, RIPv2, virtual LANs, and inter-VLAN routing, Switch Security, DHCP, Access Control List and Device management and maintenance, in both IPv4 and IPv6 networks.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the roles of routers and switches play in enabling communications across multiple networks (C2, PLO1);

CO2: Analyze switching and routing process in data packet transmission across multiple network. (C4, PLO2);

CO3: Construct operations for routers & switches with primary routing protocols and VLAN concept (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Apply professional practice in troubleshooting router and switch common errors that occur in Local Area Network (A4, PLO11);

**BCN1063**  
**STRUCTURED NETWORK CABLING**

Credit Hours: 3

Prerequisite: None

Synopsis:

This course introduces structured cabling for Local Area Network (LAN). Students are exposed to the fundamental of computer network, network topology, network devices and cabling tools, Copper cabling, Fiber Optic cabling, Simple LAN Device Installation, Wide Area Network Connection and network troubleshooting and documentation.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the theory and principles in structured network

cabling (C2, PLO1);  
 CO2: Investigate all of the elements in the LAN environment (C3, PLO2);  
 CO3: Construct structured network cabling with LAN devices based on LAN rules and standard. (P3, PLO3);  
 CO4: Demonstrate working in group to solve problem related to structured network cabling. (A3, PLO4);  
 CO5: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5).

### **BCN3263 WIRELESS NETWORKING**

Credit Hours: 3

Prerequisite: BCN1053 DATA COMMUNICATION & NETWORKING

#### Synopsis:

Wireless networking technology plays an immense role in the area of modern communication. This course provides an introduction to various current and next generation wireless networking technologies to the audiences. It undertakes a brief overview of the fundamental wireless architectures and design principles and gives emphasis on two important layers, namely layer 2 and 3 of the OSI reference model. Related protocols and their design principles are detailed and their performance is studied utilizing analytical tools and realistic simulations.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding in wireless network fundamentals and principals (C2, PLO1);  
 CO2: Analyze networking architecture based on the theories of wireless networks. (C4, PLO2);  
 CO3: Construct wireless networks for various scenarios (P4, PLO3);  
 CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);  
 CO5: Relate acquired knowledge with life long learning to verify the performance of wireless technologies by exploring various materials.

(A4, PLO9).

### **BCN3273 EMBEDDED SYSTEM DESIGN AND APPLICATION**

Credit Hour: 3

Prerequisite: BCN1043 COMPUTER ARCHITECTURE & ORGANIZATION

#### Synopsis:

This course explores all the stages related to identifying a problem that is solvable through Physical System design and application. It then discusses designing and building an Internet of Things (IoT) system to solve a problem. Intended for anyone who has an interest in learning how to design and build IoT devices, this course includes activities that expand on the course material. The focus of this course is to explore the field of the things and their connection to the IoT. In this course, you will analyze the things and connections that make up the IoT, build sensor/actuator systems using the microcontroller and single-board computer and explore the use of Cloud and Fog Technology in an IoT system.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding in designing and analyzing a physical system solution. (C2, PLO1);  
 CO2: Analyze requirement in designing and development of a physical system solution. (C4, PLO2);  
 CO3: Construct physical system solution base on the design and requirements (P4, PLO3);  
 CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);  
 CO5: Identify business proposals based on a physical system solution. (A3, PLO10)

### **BCS3453 INTEGRATED APPLICATION DEVELOPMENT FRAMEWORK**

Credit Hour: 3

Prerequisite: None

**Synopsis:**

This course covers development of applications using web, and emerging technologies with emphasis on requirements management, interface design, usability, testing, deployment, including ethical and legal considerations. This course will also make use of Laravel Framework, an application development framework that lets students easily design and deploy applications that enhance the core enterprise solution. The outcome of the course is to provide a solution to any business establishment or community that needs system in their daily activities and process.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Classify and distinguish among the processes in the integrated development environment. (C2, PLO1);

CO2: Organize and reproduce the solutions using the integrated development framework. (C4, PLO2);

CO3: Demonstrate ability to apply appropriate techniques, skills and tools in IADF to solve the related problem. (P4, PLO3);

CO4: Practice clear and effective communication to convey ideas in written and oral form confidently, accurately and coherently using appropriate context and language. (A3, PLO5);

CO5: Work effectively as part of a team to propose solution using integrated development framework. (A3, PLO8).

**BCS3443  
CYBER-PHYSICAL SYSTEMS MODELLING  
AND DESIGN**

Credit Hour: 3

Prerequisite: None

**Synopsis:**

This course introduces Cyber-Physical Systems, where physical and software components are deeply intertwined. In this course, a student will be introduced the way of CPS modelling, design and validation with different techniques and tools. At the end of

the course, a student will be able to model, to design and to validate a sample of a CPS.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Demonstrate the understanding of theory and principles of a CPS design and development. (C2, PLO1);

CO2: Model and design a system with sensing, actuating and embedded processing components corresponding to CPS requirements. (C4, PLO2);

CO3: Demonstrate ability to apply appropriate techniques, skills and tools in Cyber Physical System to solve the related problem. (P4, PLO3);

CO4: Practice clear and effective communication to convey ideas in written and oral form confidently, accurately and coherently using appropriate context and language. (A4, PLO5);

CO5: Work effectively as part of a team to model and design a cyber-physical system. (A3, PLO8).

**BCS3433  
SOFTWARE ARCHITECTURE FOR  
AUTONOMOUS SYSTEMS**

Credit Hour: 3

Prerequisite: BCS2313 ARTIFICIAL  
INTELLIGENCE TECHNIQUES

**Synopsis:**

This course introduces fundamental concepts of Autonomous Systems (AUS), the principles of their design and evolution. It describes algorithms of AUS, which allow to make a choice based on the assess of current situation and environment. Architectural design patterns for AUS are introduced. As a result of the course, students will be able to design a system that is capable for auto-configuration and self-organization.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Criticize software architecture for AUS based on the client's needs to achieve a needed level of autonomy. (C5, PLO2);

CO2: Design an autonomous system to meet the users' requirements. (P4, PLO3);

CO3: Demonstrate ability to apply appropriate techniques, skills and tools in autonomous system to solve the related problem. (C3, PLO1);

CO4: Communicate effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5);

CO5: Work effectively as part of a team to design an autonomous system static and run-time structure. (A4, PLO9).

### **BCS3423 INTEGRATED BUSINESS PROCESSING USING SAP**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course exposes students to the integrated business processes by using SAP ERP Systems. In the first part, student are exposes to the basic knowledge of the ERP including Procurement, Fulfilment, Inventory and Material Planning process. Furthermore, in the second part, as a support for the ERP, SAP system is introduced and student are exposes to the process of managing SAP applications as an administrator.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate knowledge and understanding of the theory and principles of Integrated Business Processes. (C2, PLO1);

CO2: Classify and distinguish between each business processes in their fields and how they complement each other in the term of information sharing and exchange. (C4, PLO2);

CO3: Navigate and organize all given business processes information and manage the SAP Application. (P3, PLO3);

CO4: Able to communicate clearly and effectively to convey ideas in written and oral form, confidently, accurately and coherently using appropriate context and language. (A3, PLO5);

CO5: Propose advice and implementation for

an enterprise by using Enterprise Resource Planning concepts (A4, PLO6).

### **BCM3263 AUGMENTED REALITY**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course is designed to expose to the student with the theoretical and fundamentals concept of augmented reality. The course will cover the fundamental of augmented reality concepts, history of the area, hardware technologies involved, interaction techniques, design guidelines, evaluation methods, and specific application areas. Through group assignments exposure, it also will give the students the opportunity to build a communication and leadership skills. At the end of the course, the student should be able to understand the concepts of augmented reality and utilize the skills to create their own augmented reality application.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Explain the fundamental concepts of techniques, processes, technologies and equipment used in augmented reality (C2, PLO1);

CO2: Demonstrate intellectual independence by applying the critical and evaluation skills in the application of fundamental concepts of augmented reality within specific field (C4, PLO2);

CO3: Construct an augmented reality application by implementing the fundamental concepts of augmented reality. (P4, PLO3);

CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5);

CO5: Demonstrate leadership by taking actions and influence others in order to achieve common goals in completing the task (A4, PLO8).

### **BCM3253 DATA ANALYTICS & VISUALIZATION**



Credit Hour: 3

Prerequisite: BCI2023 DATABASE SYSTEMS

Synopsis:

This course will expose students with various data processing stages including data acquisition, data cleansing, data modelling and data mapping and rendering. The data analytics topics cover basic descriptive and predictive analytics. While data visualization techniques cover the types of visualization, context of decision making and stakeholder identification. At the end of this course students will be able to attain the learning outcomes as stated in the section of course learning outcomes.

Course Outcome:

CO1: Describe the data processing stages for data analytics. (C2, PLO1);

CO2: Analyze the concept of data processing for data analytics and visualization in various applications. (C4, PLO2);

CO3: Construct a visualization application by implementing data analytics and visualization techniques. (P4, PLO3);

CO4: Perform the ability for independence learning using appropriate tools and platform. (A5, PLO6);

CO5: Analyze the numerical information to propose the suitable solutions to facilitate stakeholder decision making. (C4, PLO7);

CO6: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

### **BCN3233 CYBERCRIME AND FORENSIC COMPUTING**

Credit Hour: 3

Prerequisite: BCN2033 INFORMATION SECURITY

Synopsis:

The primary focus of this course is to give students a solid foundation by introducing computer forensics to those who are new to the field, by having the principle knowledge and skills of Computer Forensics, to

successfully identify, secure, analyze and present digital evidence. This course will enable students to relate the principle and practice of computer forensic, which builds on that foundation simultaneously enhance the skills of the IT security professional. This course is intended for novices who have a thorough grounding in computer and networking basics.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding in the nature of computer crime, digital evidence, computer forensic principle, network forensics and the role of computer forensics expert. (C2, PLO1);

CO2: Analyze the evidence from the systems based on the nature of computer crime, digital evidence, computer forensic principle, network forensics and the role of computer forensics expert. (C4, PLO2);

CO3: Correlate the evidence when doing the computer forensics examination and documentation of the findings that are suitable for use in jurisdiction purpose, in both civil and criminal matters. (P4, PLO3)

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Collaborate in team to organize new idea, solving problems related to computer forensics. (A3, PLO9).

### **BCN3113 ETHICAL HACKING**

Credit Hour: 3

Prerequisite: BCN2033 INFORMATION SECURITY

Synopsis:

This course will immerse the student into an interactive environment where they will be shown how to scan, test, hack and secure their own systems. The lab intensive environment gives each student in-depth knowledge and practical experience with the current essential security systems. Students will begin by understanding how perimeter defenses work and then be lead into scanning and attacking their own networks, no real

network is harmed. Students then learn how intruders escalate privileges and what steps can be taken to secure a system.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the theory and principles of Computer Science specializing in ethical hacking (C2, PLO1);

CO2: Analyze theory and principles of information security, element of security, hacking cycle, hacktivism and ethical hacking (C4, PLO2);

CO3: Construct attack and defense methods into computer and network environments. (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice by demonstrating usage of data and ethical hacking methods and tools. (A4, PLO11).

### **BCN3223 CRYPTOGRAPHY**

Credit Hour: 3

Prerequisite: BCI1203 PROGRAMMING TECHNIQUES, BCN2023 INFORMATION SECURITY

#### Synopsis:

This course covers most of the important aspects of cryptography that includes: symmetric and asymmetric cryptography, number theory. Since cryptography assists in providing accountability, fairness, accuracy, and confidentiality, it can prevent fraud in electronic commerce and assure the validity of financial transactions. It can also prove your identity or protect your anonymity.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate the understanding in fundamental knowledge of cryptography (C2, PLO1);

CO2: Analyze various cryptography

algorithms and relevant mathematical theories (C5, PLO2);

CO3: Construct syntax error-free program with cryptography algorithms (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Collaborate in team to organize new idea, solving problems related to cryptography. (A3, PLO9).

### **BCI3313 IOT DATA INTEGRATION**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course focus on the management and integration of real time data from the sensors and microcontroller. Student will be introduced to several data protocols in IoT such as MQTT and HTTP. Additionally, student will experience to store IoT data relational and no-SQL databases. Student will also learn to configure and visualize data on an industrial standard to IoT Platform dashboard.

#### Course Outcome:

By the end of semester, students should able to:

CO1: Explain the theory and principles of data management and data integration in IOT. (C2, PLO1);

CO2: Demonstrate ability to propose solution in related IoT data integration problems. (C4, PLO2);

CO3: Construct data management and data integration solution using appropriate techniques, skills, and tools to solve the related problem in IoT. (P4, PLO3);

CO4: Demonstrate the ability to possess relationships and collaborative skills in managing relationships in teams. (A3, PLO8);

CO5: Communicate effectively to convey ideas in written and oral form through appropriate medium. (A3, PLO5).

### **BCI3323 IOT APPLICATION DEVELOPMENT**

Credit Hour: 3

Prerequisite: BCS2313 ARTIFICIAL

## INTELLIGENCE TECHNIQUES

### Synopsis:

This course covering the current state of the art in Internet of Things in Smart Technology. Student will be exposed with multiple technology domains to develop an IOT system and its components and how it can help to support industry. This course focus on analyzing, designing and developing software application for industrial standard IOT application.

### Course Outcome:

By the end of semester, students should able to:

CO1: Analyze the fundamental of IOT environment for industrial application. (C2, PLO1);

CO2: Construct a solution into a web application for an IOT case study using IOT data. (C5, PLO2);

CO3: Construct a solution to apply appropriate analytics and machine learning techniques for IOT data. (P4, PLO3);

CO4: Demonstrate the ability to possess relationships and collaborative skills in managing a team. (P3, PLO8);

CO5: Communicate effectively in both written and oral forms through appropriate medium. (P3, PLO5).

## **BCN3343 INTEGRATED SYSTEM AND SENSOR APPLICATION.**

Credit Hour: 3

Prerequisite: BCS2163 OBJECT ORIENTED DESIGN & IMPLEMENTATION.

### Synopsis:

This course student will learn the fundamental of cyber –physical systems in embedded systems. The mechanisms by which software interacts with the physical world. This course emphasized both theory and practical in utilizing microprocessors, sensors and actuators in creating a cyber-physical system through programming techniques. Through this course, students should e able to design, construct and test their own cyber-physical system as a part of IOT technology.

### Course Outcome:

By the end of semester, student should be able to:

CO1: Demonstrate knowledge and understanding of the theory and practical of building embedded system. (C2, PLO1);

CO2: Propose a solution using embedded systems (C6, PLO2);

CO3: Develop the solution using embedded systems with appropriate tools. (P4, PLO3);

CO4: Demonstrate the ability to work in team through project completion. (A3, PLO8);

CO5: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5).

## **BCC3013 UNDERGRADUATE PROJECT I**

Credit Hour: 3

Prerequisite: None

### Synopsis:

This course aims to give students to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify and analyze the problem, propose solution, collect the required data for specific solution and conduct research on the solution. At the end, the students are able to produce a proposal that consist of the problem and proposed solution. During this course, student is supervised by appointed supervisors that will guide and monitor the students project progress. This is to ensure that the project is within the course objective.

### Course Outcome:

By the end of semester, students should be able to:

CO1: Propose a solution based on specific problem by following the principle of computing. (C4, PLO2);

CO2: Design the proposed solution through proof of concept by using appropriate tools. (P4, PLO3);

CO3: Demonstrate effective communication skills in written and oral form through report writing and presentation. (A4, PLO5);

CO4: Demonstrate student's ethics and

professional values throughout the project completion. (A4, PLO4)..

### **BCC3024 UNDERGRADUATE PROJECT II**

Credit Hour: 3

Prerequisite: BCC3012 UNDERGRADUATE PROJECT I

Synopsis:

This course aims the student to develop and test their proposed solution based on their developed project proposal. Student must be able to demonstrate the ability to implement the proposed solution in their project proposal by following the principle of computing. The student must be able to validate their proposed solution using appropriate tools. At the end of this course, student are able to produce and present their validated project and completed report of their project.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate the ability to implement the proposed solution by following the principle of computing (C4, PLO2);

CO2: Develop the solution based on the approved proposal using appropriate tools. (P4, PLO3);

CO3: Validate the solution based on the approved proposal using appropriate tools. (P4, PLO3);

CO4: Demonstrate effective communication skills in written and oral form through report writing and presentation. (A4, PLO5).

### **BCC4012 INDUSTRIAL TRAINING**

Credit Hour: 3

Prerequisite: Complete all require courses as mentioned in the Curriculum Structure.

Synopsis:

This course aims to give an experience for the student to apply their knowledge and skills that they have learned. During the internship duration, student must write and record all activities and tasks given by industrial

supervisor in the log book. Student able to demonstrate effectively interpersonal skills and act professionally in working environment. By the end of the internship, the student must provide a final report.

Course Outcome:

By the end of semester, students should be able to:

CO1: Summarize the industrial training knowledge, experience and skills into appropriate report (C4, PLO2);

CO2: Construct solution by applying appropriate techniques, skills and tools to solve tasks given by industry (P4, PLO3);

CO3: Demonstrate effective interpersonal skills throughout industrial training (A4, PLO4);

CO4: Demonstrate student ethics and professional values throughout the industrial training duration (A4, PLO11);

CO5: To communicate effectively to convey ideas in written and oral form using appropriate context and language (A4, PLO5).

### **BCI3313 MACHINE LEARNING APPLICATIONS**

Credit Hour: 3

Prerequisite: BCS2313 ARTIFICIAL INTELLIGENCE TECHNIQUES

Synopsis:

Machine learning has become an integral part of many applications and research projects as well in data science pipeline. This course covers the concepts and a wide range of machine learning techniques starting with examination of the data sets and explain trends, simple linear regression, support vector machines, decision tree based, data modelling and production, creating algorithms, predictive models, and basic of deep neural networks. At the end of this course, students practically build an appropriate machine learning model into a production of web application.

Course Outcome:

By the end of semester, students should be able to:

CO1: Explain the fundamental of the machine

learning techniques. (C2, PLO1);  
CO2: Demonstrate appropriate data exploratory and machine learning techniques in a given problem (C4, PLO2);  
CO3: Construct an application based on appropriate machine learning models to solve the given problem. (P4, PLO3);  
CO4: Demonstrate a solution using appropriate digital tools and or any platforms. (A3, PLO6);  
CO5: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5).

**BCI3293**  
**EMERGING TECHNOLOGY**

Credit Hour: 3

Prerequisite: None

Synopsis:

This course addresses several emerging trends in ICT locally and globally. The issues are raised from several areas in ICT with the Industrial Revolution 4.0 (IR4.0): autonomous robots, simulation, system integration, internet of things, cybersecurity, cloud computing, additive manufacturing, augmented reality and big data.

Course Outcome:

By the end of semester, student should be able to:

CO1: To demonstrate understanding in the emerging trends in ICT (C4/PO1);

CO2: To organize effective approaches in gathering up-to-date information and trends in ICT (P4/PO3);

CO3: To demonstrate effective skill in presenting emerging trends in ICT (oral) (A3/PO4);

CO4: To demonstrate effective skill in presenting emerging trends in ICT (written) (A3/PO4).

**CURRICULUM STRUCTURE  
BACHELOR OF COMPUTER SCIENCE (MULTIMEDIA SOFTWARE) WITH HONOURS**

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
	UHS1022 Soft Skills	UHL2412 English for Academic Communication	UHC2022 Penghayatan Etika dan Peradaban	UHF1**1 Foreign Language Level 1	UHF2**1 Foreign Language Level 2	UHL2432 English for Professional Communication	BC****3 Elective II	BCC4012 Industrial Training
	AQA2002 Ko-Kurikulum	BUM1233 Discrete Mathematics and Application	UHL2422 English for Technical Communication	BUM2413 Applied Statistics	UGE2002 Technopreneurship	BCI2323 Web Development	BC****3 Elective III	
	UHC1012 Falsafah dan Isu Semasa	BCI1093 Data Structure & Algorithms	BCI2023 Database Systems	BCS2173 Human Computer Interaction	BCI3302 Project Management & Professional Practice	BCI2313 Algorithm & Complexity	BCN2033 Information Security	
	UHL2400 Fundamental of English Language	BCS1043 Software Engineering	BCS2163 Object- Oriented Design & Implementation	BCN2053 Operating Systems	BCI3283 Mobile Application Development	BCM3013 Virtual Reality	BCC3024 Undergraduate Project II	
	BUM1153 Intermediate Mathematics	BCN1053 Data Communication & Networking	BCM2113 3D Modelling	BCM2123 3D Digital Animation	BCM3273 Multimedia Data Processing	BCM3293 Game Programming and Development		
	BCI1203 Programming Techniques	BCM2053 Computer Graphics	BC****3 Elective I	BCM3253 Data Analytics & Visualization	BCM3283 Fundamental of Game Development	BCC3013 Undergraduate Project I		
	BCN1043 Computer Architecture & Organization				BCS2323 Artificial Intelligence Techniques			
	BCM1013 Fundamental of Digital Media							
<b>TOTAL CREDIT</b>	<b>18</b>	<b>17</b>	<b>16</b>	<b>16</b>	<b>17</b>	<b>17</b>	<b>13</b>	<b>12</b>
<b>TOTAL CREDIT FOR GRADUATION</b>	<b>127</b>							

**ELECTIVE COURSES TO BE OFFERED FOR  
BACHELOR OF COMPUTER SCIENCE (MULTIMEDIA SOFTWARE) WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BCN3173	Embedded System Application & Design	3
2	BCN3233	Cybercrime and Forensic Computing	3
3	BCN3113	Ethical Hacking	3
4	BCN3223	Cryptography	3
5	BCS3433	Software Architecture for Autonomous Systems	3
6	BCS3423	Integrated Business Process With SAP	3
7	BCS3453	Integrated Application Development Framework	3
8	BCS3443	Cyber Physical System Modelling and Design	3
9	BCM3263	Augmented Reality	3
10	BCI3293	Emerging Technology	3
11	BCI3313	IoT Data Integration	3
12	BCI3323	IoT Application	3
13	BCN3343	Integrated System and Sensor Application	3
14	BCI3333	Machine Learning	3

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	<b>Competent</b> Competent ICT professionals who adopt an attitude of professionalism and contribute to the digitization agenda in organization, entrepreneurship or community across various fields.
PEO2	<b>Adaptability</b> ICT professionals who are capable to enhance competencies, leadership and personal development for career advancement and in turn contribute to the development of the country
PEO3	<b>Leadership</b> ICT professionals who are committed to their careers and community, and responsibly contributing to the perfection of society

**PROGRAMME LEARNING OUTCOMES (PLO)**

PLO1	Demonstrate knowledge and understanding of the theory and principles of Computer Science specializing in Computer Systems & Networking (Knowledge and Understanding)
PLO2	Demonstrate knowledge and understanding of the theory and principles of Computer Science specializing in Computer Systems & Networking (Cognitive Skills)
PLO3	Apply appropriate techniques, skills and tools in computer science practices specializing in Computer Systems & Networking to understanding the body of knowledge and/or solve a problem. (Practical Skills)

PLO4	Demonstrate the ability to possess relationships and collaborative skills in managing relationships in teams and within the organizations (Interpersonal Skills)
PLO5	Communicate clearly and effectively to convey ideas in written and oral form, confidently, accurately and coherently using appropriate context and language. (Communication Skills)
PLO6	Choose/use appropriate technology to support/solve the problem at hands (Digital Skills)
PLO7	Apply mathematical and other quantitative, qualitative tools to analyze and evaluate numerical & graphical / visual data for solving problem in the real context. (Numerical Skills)
PLO8	Demonstrate autonomous leadership skill to the assigned responsibilities in a team. (Leadership, Autonomy and Responsibility)
PLO9	Student possess the ability to manage themselves effectively and engage effectively in self-directed lifelong learning for achieving self-sustainability, competitiveness and employability. (Personal Skills)
PLO10	Demonstrate entrepreneurial thinking and innovational thinking within the field of computer science (Entrepreneurship Skills)
PLO11	Demonstrate ethical behavior and act professionally within the varied environment and practice. (Ethics and Professionalism)



**COURSE SYNOPSIS****BCN1043  
COMPUTER ARCHITECTURE &  
ORGANIZATION**

Credit Hour: 3

Prerequisite: None

## Synopsis:

This course discusses the component, structure and function of a computer. It expose student with the architecture and organization of a computer. This subject covers on the numbering system, data representation, the internal and external computer communication through system buses and Input/Output, computer storage, internal architecture of Central Processing Unit, Logic Gates and Boolean Algebra. Assembly languages are expose to student for better understanding of the computer structure and its component.

## Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the theory and principles of computer architecture and organization (C2, PLO1);

CO2: Classify the internal and external components of a computer structure and its functionality which include CPU, buses, memory and I/O. Explain how the components of a computer architecture and organization contribute to the computer performance. (C3, PLO2);

CO3: Differentiate the different machine data level representation by writing assembly language code to show computer inner working behavior. (P3, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Demonstrate arithmetic application on number system and performance metrics. (C3, PLO7).

**BCI1203  
PROGRAMMING TECHNIQUES**

Credit Hour: 3

Prerequisite: None

## Synopsis:

This course discusses on understanding problems and translating them into computer solution techniques using programming language. This course enables students to apply programming techniques, write programming codes from given problems and execute programming codes successfully.

## Course Outcome:

By the end of semester, students should be able to:

CO1: Describe the fundamental concept of programming techniques (C2, PLO1);

CO2: Demonstrate appropriate programming techniques in solving a given problem. (C3, PLO2);

CO3: Construct syntax error-free programs. (P3, PLO3);

CO4: Produce programming technique's solutions using appropriate digital tools and/or platforms. (A3, PLO6);

CO5: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5).

**BCN2053  
OPERATING SYSTEMS**

Credit Hour: 3

Prerequisite: None

## Synopsis:

This subject introduces the various data and control structures necessary for the design and implementation of modern computer operating systems. Memory, Processor, Concurrent, File, Device and Network Management are explored as the basic of all Operating Systems.

## Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the theory and principles of operating systems (C2, PLO1);

CO2: Distinguish the relationship between OS and hardware which includes User command interface, Memory Management, Processor Management, File Management, Device

Management & Network Management (C3, PLO2);  
 CO3: Construct OS instructions via Command line and Shell Scripting (P3, PLO3);  
 CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);  
 CO5: Manage relevant information from different sources related to the operating systems (A3, PLO6).

### **BCN1053**

#### **DATA COMMUNICATION & NETWORKING**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. It uses the OSI and TCP layered models to examine the nature and roles of protocols and services at the application, network, data link, and physical layers. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of basics computer networking (C2, PLO1);  
 CO2: Analyze process by identifying the problems in data communication. (C4, PLO2);  
 CO3: Construct a simple LAN topology by applying basic principles of cabling using network simulation and follow basic configuration of network design using real network devices such as switches and routers (P3, PLO3);  
 CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);  
 CO5: Perform standard configuration and troubleshooting network independently (A3, PLO9),

### **BCS1043**

#### **SOFTWARE ENGINEERING**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course presents an introduction to software engineering concepts including: software engineering paradigms, requirements specification, design, software verification and validation; software evolution and reliability. This course also describes the concepts and methods of information system analysis and design (structured approach), with an emphasis on system analysis methods and tools.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish the important terminology and activities involves (theoretically and practically) related to foundation concepts of software engineering and software development (C2, PLO1);  
 CO2: Show system design solutions (structured design approach) from a case study that comply with the stages of systems development life cycle (C3, PLO2);  
 CO3: Show technical solutions to a range of audience and reproduce a system design (structured design approach) from a case study that comply with the stages of systems development life cycle (P3, PLO3);  
 CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5);  
 CO5: Display an ethical and professional values in carrying out the given tasks (A3, PLO11).

### **BCI2023**

#### **DATABASE SYSTEMS**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

The course emphasizes on the importance of data to an organization and how the data should be managed. Database management system (DBMS) will be viewed as a solution to the problems of file processing system. Aspects of relational database design will be covered in details. This includes database development life cycle, database architecture,

data models, and normalization process. Structured Query Language (SQL) will be discussed and emphasized as query language in database management. Students will be given a real life problem to design and develop a database application system. In the later part of the course students will be exposed to the latest developments in database architecture.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate knowledge and understanding of the concepts, principles and applications of database systems. (C2, PLO1);

CO2: Manipulate queries using the syntax of Structure Query Language (SQL) (P4, PLO3);

CO3: Construct innovative solution through the representation of data model using ER and EER diagrams and normalize database to be implemented in database application system using SQL (C4, PLO2);

CO4: Demonstrate personal skills effectively through the punctuality and completeness of assessment submissions. (A4, PLO9);

CO5: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

### **BCI1093 DATA STRUCTURE &ALGORITHMS**

Credit Hour: 3

Prerequisite: BCI1203 PROGRAMMING TECHNIQUES

#### Synopsis:

This course is designed to expose the students to the data structures and algorithm. It provides theoretical basis in data structures and the application of data structures is based on standard algorithms. Students must also be able to transform the data structure and algorithms problems into the computer programs.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Describe the concept of data structures and algorithms. (C2, PLO1);

CO2: Analyze various types of data structures and algorithms techniques in solving a related problem. (C4, PLO2);

CO3: Construct a program by applying the data structure and algorithms techniques for a related problem. (P3, PLO3);

CO4: Communicate effectively in both written and oral forms via appropriate medium and language (A3, PLO5);

CO5: Use digital skills to find solution for a related problem (A3, PLO6).

### **BCI2313 ALGORITHMS AND COMPLEXITY**

Credit Hour: 3

Prerequisite: BCI1093 DATA STRUCTURE & ALGORITHMS

#### Synopsis:

This course covers advanced algorithms in sorting, graph theory, algorithm complexity analysis, finite state machine, regular expression and halting problem. Student will be able to analyze and evaluate the algorithms through given assessments that based on a related case study. to advanced techniques for the design and analysis of algorithms and explores variety of applications.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate basic complexity analysis to get the algorithm complexity. (C2, PLO1);

CO2: Analyze various types of algorithm techniques in solving the related problems. (C4, PLO2);

CO3: Construct a solution by applying appropriate algorithms or techniques for the related problems. (P4, PLO3);

CO4: Apply numerical knowledge which is mathematical notation to the models of computation. (C4, PLO7);

CO5: Communicate clearly and effectively to convey ideas in written and oral form. (A4, PLO5).

### **BCS2163**

**OBJECT ORIENTED DESIGN AND IMPLEMENTATION**

Credit Hour: 3

Prerequisite: BCI1203 Programming Techniques

## Synopsis:

This course introduces students to object-oriented design principles and their application using one object-oriented language. Students will also learn how to use standard notation to illustrate their designs.

## Course Outcome:

By the end of semester, students should be able to:

CO1: Describe the concept of object-oriented design in object-oriented program. (C2, PLO1);

CO2: Construct object-oriented designs and describe these designs using standard software engineering notations. (C4, PLO2);

CO3: Demonstrate the ability to implement object-oriented designs in an object-oriented programming language. (P4, CLO3);

CO4: Work with available software engineering tools to manage artifacts created during the development process and programming language tools to develop object-oriented applications. (A3, PLO4);

CO5: Practice clear and effective communication to convey ideas in written and oral form using appropriate context and language. (A3, PLO5).

**BCS2313****ARTIFICIAL INTELLIGENCE TECHNIQUES**

Credit Hour: 3

Prerequisite: BCI1093 DATA STRUCTURE &amp; ALGORITHMS

## Synopsis:

This course introduces student to the theory and practice of the Artificial Intelligence (AI). Student are expose to the main artificial intelligence topics including the fundamental issues, search strategies, knowledge representation and reasoning, advanced search, agents, machine learning and robotics. Practical examples of how artificial intelligence is applied to commercial, scientific and consumer applications will be covered.

## Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish the intelligent system concepts and methodologies in computer science. (C2, PLO1);

CO2: Demonstrate critical thinking ideas in intelligent system knowledge and problem-solving. (C4, PLO2);

CO3: Construct solution using intelligent system knowledge and problem solving. (P4, PLO3);

CO4: Apply numerical knowledge to the intelligent system solution. (C3, PLO7);

CO5: Communicate clearly, confidently, accurately, coherently and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5)

**BCN2033****INFORMATION SECURITY**

Credit Hour: 3

Prerequisite: BCN1053 DATA COMMUNICATION &amp; NETWORKING

## Synopsis:

The course introduces the fundamentals of information security providing information security basics, purposes, various types of security attacks, implementation and discussion in the aspect of security. Topics include: foundational concepts in security, principles of secure design, threats and attacks, basics of cryptography, network securing, intrusion detection and prevention systems.

## Course Outcome:

By the end of semester, students should be able to:

CO1: Understand the fundamentals of security and factors driving the need for information security (C2, PLO1);

CO2: Analyze theory and principles of information security, types of security threats, potential attacks, cryptography, firewalls, and intrusion detection systems (C4, PLO2);

CO3: Construct attack and defense methods into computer and network environments (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A4, PLO5);

CO5: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice in the context of information security A4, PLO11).

### **BCS2173 HUMAN COMPUTER INTERACTION**

Credit Hour: 3

Prerequisite: BCS1043 SOFTWARE ENGINEERING

Synopsis:

This course provides an introduction to Human-Computer Interaction (HCI). HCI is concerned with understanding, designing, implementing and evaluating user-interaction with the computers so that the designers can maximize user interaction (UI) and user experience (UX). On completing this course, the students will have knowledge of the theoretical foundations of designing the interaction between humans and computers. They will also have practical experience in implementing and evaluating the interaction.

Course Outcome:

By the end of semester, students should be able to:

CO1: Explain theory and principles of Human Computer Interaction (C2, PLO1);

CO2: Distinguish intellectual independence in the application of knowledge in Human Computer Interaction field by applying critical, analytical and evaluation skills in solving the related problems (C4, PLO2);

CO3: Construct solution by applying appropriate techniques, skills and tools in Human Computer Interaction to solve the related problem (P4, PLO3);

CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5);

CO5: Show the ability to possess relationships and collaborative skills in managing relationships in teams (A3, PLO4).

### **BCI3302**

### **PROJECT MANAGEMENT & PROFESSIONAL PRACTICE**

Credit Hours: 3

Prerequisite: None

Synopsis:

This course exposes the student with step by step project management process inclusive of project planning, evaluation, estimation, resource allocation, monitoring and control and managing people and teams to bring about the successful completion of specific project goals and objectives. Further, the professional practice in IT and entrepreneurship elements will be introduced where the student is expected to demonstrate the professional ethic and entrepreneurship traits in his/her group projects.

Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish appropriately the concepts and principles of Project Management and Professional Practice. (C2, PLO1);

CO2: Construct a practical software project management plan and report based on Professional Practice (C4, PLO2);

CO3: Use appropriate software management application/tools in software project management case study. (P4, PLO3);

CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A5, PLO5);

CO5: Demonstrate the element of entrepreneurship in project report (A5, PLO10).

### **BCI3283 MOBILE APPLICATION DEVELOPMENT**

Credit Hours: 3

Prerequisite: BCS2163 OBJECT ORIENTED DESIGN & IMPLEMENTATION

Synopsis:

This course is concerned with the development of applications on mobile and wireless computing platforms. It explores mobile application development aspects with emphasis on the relationship between theoretical and its practical application using

cases and real examples of mobile applications. Emphasis is placed on the process, tools and frameworks required to develop applications for current and emerging mobile computing devices.

Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish appropriately the concepts and principles of mobile application development. (C2, PLO1);

CO2: Analyze the limitations and challenges in mobile applications. (C4, PLO2);

CO3: Construct a mobile application using selected software development environment. (P4, PLO3);

CO4: Demonstrate the element of entrepreneurship in project report. (A4, PLO10);

CO5: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

### **BCI2323 WEB PROGRAMMING**

Credit Hours: 3

Prerequisite: BCI1203 PROGRAMMING TECHNIQUES, BCI2023 DATABASE SYSTEMS.

Synopsis:

This course introduces the essential topics of Internet programming & development of web-based applications. Students will be able to develop a dynamic web-based application by using server and client side scripting.

Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish the fundamentals of dynamic web based applications. (C2, PLO1);

CO2: Demonstrate thinking skills to solve specific problems with web based applications. (C4, PLO2);

CO3: Construct a web based application prototype using HTML, web server, database and scripting language. (P4, PLO3);

CO4: Demonstrate communication effectively in written and oral form through report and presentation session. (A4, PLO5);

CO5: Demonstrate leadership skills in resources and tasks management. (A4, PLO8).

### **BUM1233 DISCRETE MATHEMATICS AND APPLICATIONS**

Credit Hours: 3

Prerequisite: None

Synopsis:

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focusing on providing a basic theoretical foundation for further work. Students are exposed to logic and proof techniques, set theory, elementary number of theory, functions and relations, graph, trees, modelling computations and abstract algebra. This course integrates symbolic tools, graphical concepts, and numerical calculations.

Course Outcome:

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of discrete mathematics. (C2, PLO1);

CO2: Analyze mathematical problem using discrete mathematics. (C4, PLO2);

CO3: Provide solution to discrete mathematics problems arise from computer science and engineering field. (C5, PLO2).

### **BUM2413 APPLIED STATISTICS**

Credit Hours: 3

Prerequisite: None

Synopsis:

This course discusses on statistical problem solving methodology and descriptive statistics; sampling distribution and confidence interval; hypothesis testing; analysis of variance (ANOVA); goodness-of-fit test and contingency tables; regression and correlation including simple and multiple linear regressions. Microsoft Excel software will be used in this course as a statistical package

(other statistical packages are SPSS, R Language, S Plus, EViews and Minitab shall be used in this course).

Course Outcome:

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of statistics. (C3, PLO1);

CO2: Perform statistical analysis by using appropriate statistical theory and methodology. (C4, PLO2);

CO3: Analyze real life to solve related problem in various disciplines. (C4, PLO2).

### **BUM1153 INTERMEDIATE MATHEMATICS**

Credit Hours: 3

Prerequisite: None

Synopsis:

This course introduces and discusses the fundamental of mathematics focusing on providing a solid theoretical foundation for further work. Student are exposed to number system, equations, inequalities and absolute value, polynomials, sequences and series, matrices and system of linear equations, functions and graphs, and trigonometric functions. This course also integrates symbolic tools, graphical concepts, and numerical calculations.

Course Outcome:

By the end of semester, students should be able to:

CO1: Acquire the fundamental principles of basic mathematics (C3, PLO1);

CO2: Apply the appropriate method to solve mathematical problems (C4, PLO2).

### **BCM3253 DATA ANALYTICS & VISUALIZATION**

Credit Hour: 3

Prerequisite: BC12023 DATABASE SYSTEMS

Synopsis:

This course will expose students with various data processing stages including data acquisition, data cleansing, data modelling

and data mapping and rendering. The data analytics topics cover basic descriptive and predictive analytics. While data visualization techniques cover the types of visualization, context of decision making and stakeholder identification. At the end of this course students will able to attain the learning outcomes as stated in the section of course learning outcomes.

Course Outcome:

CO1: Describe the data processing stages for data analytics. (C2, PLO1);

CO2: Analyze the concept of data processing for data analytics and visualization in various applications. (C4, PLO2);

CO3: Construct a visualization application by implementing data analytics and visualization techniques. (P4, PLO3);

CO4: Perform the ability for independence learning using appropriate tools and platform. (A5, PLO6);

CO5: Analyze the numerical information to propose the suitable solutions to facilitate stakeholder decision making. (C4, PLO7);

CO6: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

### **BCM1013 FUNDAMENTAL OF DIGITAL MEDIA**

Credit Hour: 3

Prerequisite: None

Synopsis:

This course will provide students the foundations of digital media. Students will capture and manipulate digital media and learn to create dynamic designs. through design elements and principles. This course will also expose students to the theoretical and fundamental concepts of digital media, basic processing and its applications. Topics to be covered include five elements of multimedia such as text and audio, animation, image and video. At the end of the course students be able to recognize all digital media elements, Intellectual Properties and able to create basic digital media mini project development through its process such as storyboarding.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Describe the digital media terminology, design, software, principles, equipment, project flow and Multimedia ethics. (C2, PLO1);

CO2: Construct digital media basic interface by manipulating multimedia elements (text, graphic, audio, video & animation) using software tools (C3, PLO2);

CO3: Create simple multimedia project development through its process such as storyboarding and Multimedia Development Lifecycle (P3, PLO3)

CO4 Function effectively as an individual, members and leader in diverse teams based on tasks assigned. (A3, PLO4);

CO5: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5).

**BCM2053****COMPUTER GRAPHICS**

Credit Hour: 3

Prerequisite: BC11203 PROGRAMMINGN TECHNIQUES

**Synopsis:**

This course introduces students to the fundamental of computer graphics and its applications. This includes understanding and designing aspects of computer graphics using standard graphics libraries. It will emphasize generation of 2D primitives, 2D and 3D transformations. Students are required to produce 2D/3D application in order to reinforce their understanding. At the end of the course, the student should be able to understand how a computer graphics system works and develop simple graphics application.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Describe the computer graphics concepts and ability to use the computer graphics technology. (C2, PLO1);

CO2: Develop 2D and 3D graphics by implementing concepts of computer graphics

and computer graphics programming. (C4, PLO2);

CO3: Develop simple graphics application using standard graphics libraries. (P3, PLO3);

CO4: Demonstrate personal skills effectively through the punctuality and completeness of assessment submissions. (A3, PLO9);

CO5: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5).

**BCM2113****3D MODELLING**

Credit Hour: 3

Prerequisite: None

**Synopsis:**

In this course students are given the opportunity to master the fundamentals 3D modelling concept and techniques. Students will learn about 3D modelling methods such as modelling with NURBS, polygons, and subdivision surfaces. They will also expose with the process involves in the production pipeline and gain experience in developing 3D models through exercises and project. Students will get involve in group activity that will enhance their team working and interpersonal skills.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Describe the 3D modeling basic concepts and its methods (C2, PLO1);

CO2: Analyze the knowledge of 3D modelling in designing and developing the 3D models (C4, PLO2);

CO3: Construct 3D modelling by implementing concepts of 3D modelling (P4, PLO3);

CO4: Demonstrate the ability to possess relationships and collaborative skills in managing relationships in a team. (A4, PLO4);

CO5: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

**BCM2123****3D DIGITAL ANIMATION**



Credit Hour: 3

Prerequisite: BCM2113 3D MODELLING

Synopsis:

This course will expose the student with the basic concept, techniques and practice of animation. Student will learn about the state of computer animation and working towards an overall understanding of the computer animation. At the end of this course, students will gain proficiency by creating exercises and projects that involves team working that cater their interpersonal skills. Student will also be exposed with hardware and software used in creating an animation that follow the industry standard.

Course Outcome:

By the end of semester, students should be able to:

CO1: Explain the foundation of animation using computer and technology. (C2, PLO1);

CO2: Analyze the knowledge of animation in designing and producing the animation. (C4, PLO2);

CO3: Develop computer animation using appropriate techniques and tools. (P4, PLO3);

CO4: Demonstrate the ability to possess relationships and collaborative skills in managing relationships in a team. (A4, PLO4);

CO5: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

### **BCM3273 MULTIMEDIA DATA PROCESSING**

Credit Hour: 3

Prerequisite: BCI1203 PROGRAMMING TECHNIQUES

Synopsis:

This course will expose the students on the enhanced knowledge and technical aspect in the process of multimedia data. Students are required to understand the theory and technique for data acquisition, sampling, representation, pre-processing, storage and recognition. Student will learn and practice on developing multimedia application which involving multimedia representation and manipulation. At the end of the course, the

student should be able to process multimedia data and develop simple multimedia application.

Course Outcome:

By the end of semester, students should be able to:

CO1: Explain the concept of multimedia data processing in terms of representation and storage (C2, PLO1);

CO2: Analyze different types of multimedia data processing and its techniques (C4, PLO2);

CO3: Develop multimedia application using an appropriate programming to handle and process multimedia data (P4, PLO3);

CO4: Practice responsibility, integrity and relation in a group to achieve project goal (A5, PLO11);

CO5: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

### **BCM3283 FUNDAMENTAL OF GAME DEVELOPMENT**

Credit Hours: 3

Prerequisite: BCS2363 OBJECT ORIENTED DESIGN & DEVELOPMENT

Synopsis:

This course will expose students to the fundamental concepts of games design and development. Topics to be covered are the introduction of game development, game development pipeline, game design, 2D game development, copyright laws and basic knowledge of business in games. At the end of this course, student should be able to produce proposal, game design document, develop simple 2D games application and identify suitable market for games application.

Course Outcome:

By the end of semester, students should be able to:

CO1: Explain the various components in game application and development process across diverse game genre and platform. (C2, PLO1);

CO2: Design specific game application based on the fundamental concepts of game design and development. (C5, PLO2);

CO3: Display the ability to develop 2D games using suitable tools based on game development pipeline. (P4, PLO3);

CO4: Demonstrate the ability to communicate clearly and effectively either in written and oral presentation using appropriate context and language during the game development process. (A4, PLO5);

CO5: Demonstrate the ability to identify potential market and poses idea on marketing strategy for games product. (A4, PLO10).

### **BCM3103 VIRTUAL REALITY**

Credit Hours: 3

Prerequisite: None

#### Synopsis:

This course introduces the concepts of virtual reality and enables the students to gain hands-on experience by developing their own virtual reality applications. The student will discover the fundamentals of virtual reality, the hardware, the concepts and technologies of VR interaction, learn the basics of 3D graphics and how to lay them out to create an environment. Besides, students also will be able to acquire communication and leadership skills through assignments and projects. At the end of the course, the student should be able to understand the concepts of virtual reality and utilize the skills to create their own virtual reality applications.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Explain the fundamental concept of techniques, processes, technologies and equipment used in virtual reality (C2, PLO1);

CO2: Demonstrate intellectual independence by applying the critical and evaluation skills in the application of fundamental concepts of virtual reality within specific field (C4, PLO2);

CO3: Demonstrate the ability to develop a virtual reality application by implementing the fundamental concepts of virtual reality. (P4, PLO3);

CO4: Communicate clearly and effectively to convey ideas in written and oral form using

appropriate context and language. (A4, PLO5);

CO5: Work autonomously, and show leadership and professionalism in managing responsibilities within a group task completion. (A4, PLO8).

### **BCM3293 GAME PROGRAMMING AND DEVELOPMENT**

Credit Hours: 3

Prerequisite: BCM3283 FUNDAMENTAL OF GAME DEVELOPMENT

#### Synopsis:

This course will expose students to the theoretical, fundamental concepts, functional logic and implementation of game programming in game Development. Topics to be covered including retrieving user input, game engine and runtime engine architecture, level design and character animation in game, game physics, kinematics, projectiles, collisions, physics of explosion, Artificial Intelligence(AI) navigation and its engine and other related sub topics that contributed to the development of game application and its underlying logic. At the end of this course, student should be able to programme the functional logic of physics and AI navigation in game development.

#### Course Outcome:

CO1: Explain the fundamental of basic game mechanics and object oriented programming in game developments. (C2, PLO1);

CO2: Analyse the functional logic in game design based on different components and mechanism in the development of games application. (C4, PLO2);

CO3: Construct a game application using appropriate game engine by manipulating the game objects and Assets. (P4, PLO3);

CO4: Construct the functional game logic by utilizing the physics and Artificial Intelligence concepts in games development. (C3, PLO7);

CO5: Organize the outcome of the functional logic programme in the development of game application in written and oral form using appropriate context and learning. (A4, PLO5).

### **BCM2013**

**DIGITAL IMAGE PROCESSING**

Credit Hour: 3

Prerequisite: None

## Synopsis:

This course covers an introduction to digital image processing techniques and concepts. Students will be exposed with all the basic concepts, definitions, models, and algorithms necessary to understand computer imaging. It covers several image processing methods including image enhancement, transforms, restoration, encoding, segmentation, description, and recognition and classification. At the end of the course by adopting this knowledge, students will be able to develop essential technical skills in solving related problems involving image processing.

## Course Outcome:

By the end of the semester, student should able to:

CO1: Describe the broad range of fundamental image processing (C2, PLO1);

CO2: Analyze different types of image processing solutions and techniques (C4, PLO2);

CO3: Construct computerized practical solutions to common image processing problems using related techniques (P4, PLO3);

CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language (A4, PLO5);

CO5: Work independently while demonstrating leadership and professionalism in handling tasks within a collaborative task (A4, PLO8).

**BCM2973****MODELLING AND SIMULATION**

Credit Hour: 3

Prerequisite: BCI1203 PROGRAMMING TECHNIQUES

## Synopsis:

This course will discuss the general concept, processes and techniques to develop modelling and simulation application or project. Topics to be covered are introduction of modelling and simulation, tool and software, types of simulation, process and techniques

including model formulation, data collection and analysis, model translation/simulation, and verification and validation. Student will expose to several case study of modelling and simulation project which focus on continuous, discrete and agent-based simulation applications across a variety of engineering domains. At the end of the course, students are expected to equip themselves with adequate skill of modeling and simulation by developing simulation projects that address related research issues and/or industrial applications.

## Course Outcome:

By the end of the semester, student should able to:

CO1: Understand the general concept, issues, process, and related techniques of modeling and simulation. (C2, PLO1);

CO2: Analyze solution and techniques for modelling and simulation process including model formulation, translation, analysis and validation of simulation result. (C4, PLO2);

CO3: Construct simulation model for a specific problem based on the fundamental concept, process and techniques of modelling and simulation. (P4, PLO3);

CO4: Prepare a comprehensive report and an oral presentation with accurate visual representations of a model and its results. (A4, PLO5);

CO5: Display independence in learning and exploring the process and techniques of modeling and simulation. (A5, PLO6).

**BCS3453****INTEGRATED APPLICATION DEVELOPMENT FRAMEWORK**

Credit Hour: 3

Prerequisite: None

## Synopsis:

This course covers development of applications using web, and emerging technologies with emphasis on requirements management, interface design, usability, testing, deployment, including ethical and legal considerations. This course will also make use of Laravel Framework, an application development framework that lets students easily design and deploy applications that enhance the core enterprise

solution. The outcome of the course is to provide a solution to any business establishment or community that needs system in their daily activities and process.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Classify and distinguish among the processes in the integrated development environment. (C2, PLO1);

CO2: Organize and reproduce the solutions using the integrated development framework. (C4, PLO2);

CO3: Demonstrate ability to apply appropriate techniques, skills and tools in IADF to solve the related problem. (P4, PLO3);

CO4: Practice clear and effective communication to convey ideas in written and oral form confidently, accurately and coherently using appropriate context and language. (A3, PLO5);

CO5: Work effectively as part of a team to propose solution using integrated development framework. (A3, PLO8).

### **BCS3443 CYBER-PHYSICAL SYSTEMS MODELLING AND DESIGN**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course introduces Cyber-Physical Systems, where physical and software components are deeply intertwined. In this course, a student will be introduced the way of CPS modelling, design and validation with different techniques and tools. At the end of the course, a student will be able to model, to design and to validate a sample of a CPS.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate the understanding of theory and principles of a CPS design and development. (C2, PLO1);

CO2: Model and design a system with sensing, actuating and embedded processing

components corresponding to CPS requirements. (C4, PLO2);

CO3: Demonstrate ability to apply appropriate techniques, skills and tools in Cyber Physical System to solve the related problem. (P4, PLO3);

CO4: Practice clear and effective communication to convey ideas in written and oral form confidently, accurately and coherently using appropriate context and language. (A4, PLO5);

CO5: Work effectively as part of a team to model and design a cyber-physical system. (A3, PLO8).

### **BCS3433 SOFTWARE ARCHITECTURE FOR AUTONOMOUS SYSTEMS**

Credit Hour: 3

Prerequisite: BCS2313 ARTIFICIAL INTELLIGENCE TECHNIQUES

#### Synopsis:

This course introduces fundamental concepts of Autonomous Systems (AUS), the principles of their design and evolution. It describes algorithms of AUS, which allow to make a choice based on the assess of current situation and environment. Architectural design patterns for AUS are introduced. As a result of the course, students will be able to design a system that is capable for auto-configuration and self-organization.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Criticize software architecture for AUS based on the client's needs to achieve a needed level of autonomy. (C5, PLO2);

CO2: Design an autonomous system to meet the users' requirements. (P4, PLO3);

CO3: Demonstrate ability to apply appropriate techniques, skills and tools in autonomous system to solve the related problem. (C3, PLO1);

CO4: Communicate effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5);

CO5: Work effectively as part of a team to design an autonomous system static and run-time structure. (A4, PLO9).

**BCS3423  
INTEGRATED BUSINESS PROCESSING  
USING SAP**

Credit Hour: 3

Prerequisite: None

**Synopsis:**

This course exposes students to the integrated business processes by using SAP ERP Systems. In the first part, student are exposes to the basic knowledge of the ERP including Procurement, Fulfilment, Inventory and Material Planning process. Furthermore, in the second part, as a support for the ERP, SAP system is introduced and student are exposes to the process of managing SAP applications as an administrator.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Demonstrate knowledge and understanding of the theory and principles of Integrated Business Processes. (C2, PLO1);

CO2: Classify and distinguish between each business processes in their fields and how they complement each other in the term of information sharing and exchange. (C4, PLO2);

CO3: Navigate and organize all given business processes information and manage the SAP Application. (P3, PLO3);

CO4: Able to communicate clearly and effectively to convey ideas in written and oral form, confidently, accurately and coherently using appropriate context and language. (A3, PLO5);

CO5: Propose advice and implementation for an enterprise by using Enterprise Resource Planning concepts (A4, PLO6).

**BCM3263  
AUGMENTED REALITY**

Credit Hour: 3

Prerequisite: None

**Synopsis:**

This course is designed to expose to the student with the theoretical and fundamentals

concept of augmented reality. The course will cover the fundamental of augmented reality concepts, history of the area, hardware technologies involved, interaction techniques, design guidelines, evaluation methods, and specific application areas. Through group assignments exposure, it also will give the students the opportunity to build a communication and leadership skills. At the end of the course, the student should be able to understand the concepts of augmented reality and utilize the skills to create their own augmented reality application.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Explain the fundamental concepts of techniques, processes, technologies and equipment used in augmented reality (C2, PLO1);

CO2: Demonstrate intellectual independence by applying the critical and evaluation skills in the application of fundamental concepts of augmented reality within specific field (C4, PLO2);

CO3: Construct an augmented reality application by implementing the fundamental concepts of augmented reality. (P4, PLO3);

CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5);

CO5: Demonstrate leadership by taking actions and influence others in order to achieve common goals in completing the task (A4, PLO8).

**BCN3273  
EMBEDDED SYSTEM DESIGN AND  
APPLICATION**

Credit Hour: 3

Prerequisite: BCN1043 COMPUTER ARCHITECTURE & ORGANIZATION

**Synopsis:**

This course explores all the stages related to identifying a problem that is solvable through Physical System design and application. It then discusses designing and building an Internet of Things (IoT) system to solve a problem. Intended for anyone who has an interest in learning how to design and build IoT

devices, this course includes activities that expand on the course material. The focus of this course is to explore the field of the things and their connection to the IoT. In this course, you will analyze the things and connections that make up the IoT, build sensor/actuator systems using the microcontroller and single-board computer and explore the use of Cloud and Fog Technology in an IoT system.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding in designing and analyzing a physical system solution. (C2, PLO1);

CO2: Analyze requirement in designing and development of a physical system solution. (C4, PLO2);

CO3: Construct physical system solution base on the design and requirements (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Identify business proposals based on a physical system solution. (A3, PLO10)

### **BCN3233 CYBERCRIME AND FORENSIC COMPUTING**

Credit Hour: 3

Prerequisite: BCN2033 INFORMATION SECURITY

#### Synopsis:

The primary focus of this course is to give students a solid foundation by introducing computer forensics to those who are new to the field, by having the principle knowledge and skills of Computer Forensics, to successfully identify, secure, analyze and present digital evidence. This course will enable students to relate the principle and practice of computer forensic, which builds on that foundation simultaneously enhance the skills of the IT security professional. This course is intended for novices who have a thorough grounding in computer and networking basics.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding in the nature of computer crime, digital evidence, computer forensic principle, network forensics and the role of computer forensics expert. (C2, PLO1);

CO2: Analyze the evidence from the systems based on the nature of computer crime, digital evidence, computer forensic principle, network forensics and the role of computer forensics expert. (C4, PLO2);

CO3: Correlate the evidence when doing the computer forensics examination and documentation of the findings that are suitable for use in jurisdiction purpose, in both civil and criminal matters. (P4, PLO3)

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Collaborate in team to organize new idea, solving problems related to computer forensics. (A3, PLO9).

### **BCN3113 ETHICAL HACKING**

Credit Hour: 3

Prerequisite: BCN2033 INFORMATION SECURITY

#### Synopsis:

This course will immerse the student into an interactive environment where they will be shown how to scan, test, hack and secure their own systems. The lab intensive environment gives each student in-depth knowledge and practical experience with the current essential security systems. Students will begin by understanding how perimeter defenses work and then be lead into scanning and attacking their own networks, no real network is harmed. Students then learn how intruders escalate privileges and what steps can be taken to secure a system.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the theory and principles of Computer Science specializing in ethical hacking (C2, PLO1);

CO2: Analyze theory and principles of information security, element of security,

hacking cycle, hacktivism and ethical hacking (C4, PLO2);

CO3: Construct attack and defense methods into computer and network environments. (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice by demonstrating usage of data and ethical hacking methods and tools. (A4, PLO11).

### **BCN3223 CRYPTOGRAPHY**

Credit Hour: 3

Prerequisite: BCI1203 PROGRAMMING TECHNIQUES, BCN2023 INFORMATION SECURITY

Synopsis:

This course covers most of the important aspects of cryptography that includes: symmetric and asymmetric cryptography, number theory. Since cryptography assists in providing accountability, fairness, accuracy, and confidentiality, it can prevent fraud in electronic commerce and assure the validity of financial transactions. It can also prove your identity or protect your anonymity.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate the understanding in fundamental knowledge of cryptography (C2, PLO1);

CO2: Analyze various cryptography algorithms and relevant mathematical theories (C5, PLO2);

CO3: Construct syntax error-free program with cryptography algorithms (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Collaborate in team to organize new idea, solving problems related to cryptography. (A3, PLO9).

### **BCI3313 IOT DATA INTEGRATION**

Credit Hour: 3

Prerequisite: None

Synopsis:

This course focus on the management and integration of real time data from the sensors and microcontroller. Student will be introduced to several data protocols in IoT such as MQTT and HTTP. Additionally, student will experience to store IoT data relational and no-SQL databases. Student will also learn to configure and visualize data on an industrial standard to IoT Platform dashboard.

Course Outcome:

By the end of semester, students should able to:

CO1: Explain the theory and principles of data management and data integration in IOT. (C2, PLO1);

CO2: Demonstrate ability to propose solution in related IoT data integration problems. (C4, PLO2);

CO3: Construct data management and data integration solution using appropriate techniques, skills, and tools to solve the related problem in IoT. (P4, PLO3);

CO4: Demonstrate the ability to possess relationships and collaborative skills in managing relationships in teams. (A3, PLO8);

CO5: Communicate effectively to convey ideas in written and oral form through appropriate medium. (A3, PLO5).

### **BCI3323 IOT APPLICATION DEVELOPMENT**

Credit Hour: 3

Prerequisite: BCS2313 ARTIFICIAL INTELLIGENCE TECHNIQUES

Synopsis:

This course covering the current state of the art in Internet of Things in Smart Technology. Student will be exposed with multiple technology domains to develop an IOT system and its components and how it can help to support industry. This course focus on analyzing, designing and developing software application for industrial standard IOT application.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Analyze the fundamental of IOT environment for industrial application. (C2, PLO1);

CO2: Construct a solution into a web application for an IOT case study using IOT data. (C5, PLO2);

CO3: Construct a solution to apply appropriate analytics and machine learning techniques for IOT data. (P4, PLO3);

CO4: Demonstrate the ability to possess relationships and collaborative skills in managing a team. (P3, PLO8);

CO5: Communicate effectively in both written and oral forms through appropriate medium. (P3, PLO5).

**BCN3343  
INTEGRATED SYSTEM AND SENSOR APPLICATION.**

Credit Hour: 3

Prerequisite: BCS2163 OBJECT ORIENTED DESIGN & IMPLEMENTATION.

**Synopsis:**

This course student will learn the fundamental of cyber –physical systems in embedded systems. The mechanisms by which software interacts with the physical world. This course emphasized both theory and practical in utilizing microprocessors, sensors and actuators in creating a cyber-physical system through programming techniques. Through this course, students should be able to design, construct and test their own cyber-physical system as a part of IOT technology.

**Course Outcome:**

By the end of semester, student should be able to:

CO1: Demonstrate knowledge and understanding of the theory and practical of building embedded system. (C2, PLO1);

CO2: Propose a solution using embedded systems (C6, PLO2);

CO3: Develop the solution using embedded systems with appropriate tools. (P4, PLO3);

CO4: Demonstrate the ability to work in team through project completion. (A3, PLO8);

CO5: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5).

**BCC3013  
UNDERGRADUATE PROJECT I**

Credit Hour: 3

Prerequisite: None

**Synopsis:**

This course aims to give students to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify and analyze the problem, propose solution, collect the required data for specific solution and conduct research on the solution. At the end, the students are able to produce a proposal that consist of the problem and proposed solution. During this course, student is supervised by appointed supervisors that will guide and monitor the students project progress. This is to ensure that the project is within the course objective.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Propose a solution based on specific problem by following the principle of computing. (C4, PLO2);

CO2: Design the proposed solution through proof of concept by using appropriate tools. (P4, PLO3);

CO3: Demonstrate effective communication skills in written and oral form through report writing and presentation. (A4, PLO5);

CO4: Demonstrate student's ethics and professional values throughout the project completion. (A4, PLO4)..

**BCC3024  
UNDERGRADUATE PROJECT II**

Credit Hour: 3

Prerequisite: BCC3012 UNDERGRADUATE PROJECT I

**Synopsis:**

his course aims the student to develop and test their proposed solution based on their developed project proposal. Student must be



able to demonstrate the ability to implement the proposed solution in their project proposal by following the principle of computing. The student must be able to validate their proposed solution using appropriate tools. At the end of this course, students are able to produce and present their validated project and completed report of their project.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate the ability to implement the proposed solution by following the principle of computing (C4, PLO2);

CO2: Develop the solution based on the approved proposal using appropriate tools. (P4, PLO3);

CO3: Validate the solution based on the approved proposal using appropriate tools. (P4, PLO3);

CO4: Demonstrate effective communication skills in written and oral form through report writing and presentation. (A4, PLO5).

### **BCC4012 INDUSTRIAL TRAINING**

Credit Hour: 3

Prerequisite: Complete all require courses as mentioned in the Curriculum Structure.

#### Synopsis:

This course aims to give an experience for the student to apply their knowledge and skills that they have learned. During the internship duration, student must write and record all activities and tasks given by industrial supervisor in the log book. Student able to demonstrate effectively interpersonal skills and act professionally in working environment. By the end of the internship, the student must provide a final report.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Summarize the industrial training knowledge, experience and skills into appropriate report (C4, PLO2);

CO2: Construct solution by applying appropriate techniques, skills and tools to solve tasks given by industry (P4, PLO3);

CO3: Demonstrate effective interpersonal skills throughout industrial training (A4, PLO4);

CO4: Demonstrate student ethics and professional values throughout the industrial training duration (A4, PLO11);

CO5: To communicate effectively to convey ideas in written and oral form using appropriate context and language (A4, PLO5).

### **BCI3313 MACHINE LEARNING APPLICATIONS**

Credit Hour: 3

Prerequisite: BCS2313 ARTIFICIAL INTELLIGENCE TECHNIQUES

#### Synopsis:

Machine learning has become an integral part of many applications and research projects as well in data science pipeline. This course covers the concepts and a wide range of machine learning techniques starting with examination of the data sets and explain trends, simple linear regression, support vector machines, decision tree based, data modelling and production, creating algorithms, predictive models, and basic of deep neural networks. At the end of this course, students practically build an appropriate machine learning model into a production of web application.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Explain the fundamental of the machine learning techniques. (C2, PLO1);

CO2: Demonstrate appropriate data exploratory and machine learning techniques in a given problem (C4, PLO2);

CO3: Construct an application based on appropriate machine learning models to solve the given problem. (P4, PLO3);

CO4: Demonstrate a solution using appropriate digital tools and or any platforms. (A3, PLO6);

CO5: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5).

### **BCI3293 EMERGING TECHNOLOGY**

Credit Hour: 3  
Prerequisite: None

Synopsis:

This course addresses several emerging trends in ICT locally and globally. The issues are raised from several areas in ICT with the Industrial Revolution 4.0 (IR4.0): autonomous robots, simulation, system integration, internet of things, cybersecurity, cloud computing, additive manufacturing, augmented reality and big data.

Course Outcome:

By the end of semester, student should be able to:

CO1: To demonstrate understanding in the emerging trends in ICT (C4, PO1);

CO2: To organize effective approaches in gathering up-to-date information and trends in ICT (P4, PO3);

CO3: To demonstrate effective skill in presenting emerging trends in ICT (oral) (A3, PO4);

CO4: To demonstrate effective skill in presenting emerging trends in ICT (written) (A3, PO4)

**CURRICULUM STRUCTURE  
BACHELOR OF COMPUTER SCIENCE (SOFTWARE ENGINEERING) WITH HONOURS**

YEAR	FIRST		SECOND		THIRD		FOURTH		
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	
COURSES	BCI1203 Programming Techniques	BCI1093 Data Structure & Algorithms	BCI2323 Web Development	BCI3283 Mobile Application Development	BCI2313 Algorithm & Complexity	BCS3353 Special Topics in Software Engineering	BCS3153 Software Evolution & Maintenance	BCC4012 Industrial Training	
	BCN1043 Computer Architecture & Organization	BCI2023 Database Systems	BCS2163 Object-Oriented Design & Implementation	BUM2413 Applied Statistics	BCN2033 Information Security	BCS3233 Software Testing	BCS3263 Software Quality Assurance		
	BCS1043 Software Engineering	BCN2053 Operating Systems	BCS2323 Artificial Intelligence	BCS2233 Software Requirement Workshop	BCS2343 Software Design Workshop	BCC3013 Undergraduate Project 1	BCI3302 Project Management & Professional Practice		
	BCN1053 Data Communication & Networking	BCS2173 Human Computer Interaction	BUM1233 Discrete Mathematics & Application	BCS2243 Web Engineering	BCS3473 Secure Software Development	BC*3**3 Elective II	BCC3024 Undergraduate Project II		
	BUM1153 Intermediate Mathematics	UHL2400 Fundamentals of English Language	UHL2412 English for Academic Communication	BCS2213 Formal Methods	BC*3**3 Elective I	BC*3**3 Elective III			
	UHC1012 Falsafah dan Isu Semasa	UHC2022 Penghayatan Etika dan Peradaban	UGEE2002 Technopreneurship	UHL2422 English for Technical Communication	UHL2432 English for Professional Communication	UHF2**1 Foreign Language Level II			
	UHS1022 Softskills	UQA2002 Ko-Kurikulum	UHF1**1 Foreign Language Level 1						
	<b>TOTAL CREDIT</b>	<b>19</b>	<b>16</b>	<b>17</b>	<b>17</b>	<b>17</b>	<b>16</b>	<b>12</b>	<b>12</b>
	<b>TOTAL CREDIT FOR GRADUATION</b>	<b>126</b>							

**ELECTIVE COURSES TO BE OFFERED FOR BACHELOR OF  
COMPUTER SCIENCE (SOFTWARE ENGINEERING) WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BCN3173	Embedded System Application & Design	3
2	BCN3233	Cybercrime and Forensic Computing	3
3	BCN3113	Ethical Hacking	3
4	BCN3223	Cryptography	3
5	BCS3433	Software Architecture for Autonomous Systems	3
6	BCS3423	Integrated Business Process With SAP	3
7	BCS3453	Integrated Application Development Framework	3
8	BCS3443	Cyber Physical System Modelling and Design	3
9	BCM3253	Data Analytics and Visualization	3
10	BCM3263	Augmented Reality	3
11	BCI3293	Emerging Technology	3
12	BCI3313	IoT Data Integration	3
13	BCI3323	IoT Application	3
14	BCN3343	Integrated System and Sensor Application	3
15	BCI3333	Machine Learning	3

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	<b>Competent</b> Competent ICT professionals who adopt an attitude of professionalism and contribute to the digitization agenda in organization, entrepreneurship or community across various fields.
PEO2	<b>Adaptability</b> ICT professionals who are capable to enhance competencies, leadership and personal development for career advancement and in turn contribute to the development of the country.
PEO3	<b>Leadership</b> ICT professionals who are committed to their careers and community, and responsibly contributing to the perfection of society.

**PROGRAMME LEARNING OUTCOMES (PLO)**

PLO1	Demonstrate knowledge and understanding of the theory and principles of Computer Science specializing in Computer Systems & Networking (Knowledge and Understanding)
PLO2	Demonstrate knowledge and understanding of the theory and principles of Computer Science specializing in Computer Systems & Networking (Cognitive Skills)

PLO3	Apply appropriate techniques, skills and tools in computer science practices specializing in Computer Systems & Networking to understanding the body of knowledge and/or solve a problem. (Practical Skills)
PLO4	Demonstrate the ability to possess relationships and collaborative skills in managing relationships in teams and within the organizations (Interpersonal Skills)
PLO5	Communicate clearly and effectively to convey ideas in written and oral form, confidently, accurately and coherently using appropriate context and language. (Communication Skills)
PLO6	Choose/use appropriate technology to support/solve the problem at hands (Digital Skills)
PLO7	Apply mathematical and other quantitative, qualitative tools to analyze and evaluate numerical & graphical / visual data for solving problem in the real context. (Numerical Skills)
PLO8	Demonstrate autonomous leadership skill to the assigned responsibilities in a team. (Leadership, Autonomy and Responsibility)
PLO9	Student possess the ability to manage themselves effectively and engage effectively in self-directed lifelong learning for achieving self-sustainability, competitiveness and employability. (Personal Skills)
PLO10	Demonstrate entrepreneurial thinking and innovational thinking within the field of computer science (Entrepreneurship Skills)
PLO11	Demonstrate ethical behavior and act professionally within the varied environment and practice. (Ethics and Professionalism)

**COURSE SYNOPSIS****BCN1043  
COMPUTER ARCHITECTURE &  
ORGANIZATION**

Credit Hour: 3

Prerequisite: None

## Synopsis:

This course discusses the component, structure and function of a computer. It exposes student with the architecture and organization of a computer. This subject covers on the numbering system, data representation, the internal and external computer communication through system buses and Input/Output, computer storage, internal architecture of Central Processing Unit, Logic Gates and Boolean Algebra. Assembly languages are expose to student for better understanding of the computer structure and its component.

## Course Outcome:

By the end of semester, students should be able to:

- CO1: Demonstrate understanding of the theory and principles of computer architecture and organization (C2, PLO1);  
 CO2: Classify the internal and external components of a computer structure and its functionality which include CPU, buses, memory and I/O. Explain how the components of a computer architecture and organization contribute to the computer performance. (C3, PLO2);  
 CO3: Differentiate the different machine data level representation by writing assembly language code to show computer inner working behavior. (P3, PLO3);  
 CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);  
 CO5: Demonstrate arithmetic application on number system and performance metrics. (C3, PLO7).

**BCI1203  
PROGRAMMING TECHNIQUES**

Credit Hour: 3

Prerequisite: None

## Synopsis:

This course discusses on understanding problems and translating them into computer solution techniques using programming language. This course enables students to apply programming techniques, write programming codes from given problems and execute programming codes successfully.

## Course Outcome:

By the end of semester, students should be able to:

- CO1: Describe the fundamental concept of programming techniques (C2, PLO1);  
 CO2: Demonstrate appropriate programming techniques in solving a given problem. (C3, PLO2);  
 CO3: Construct syntax error-free programs. (P3, PLO3);  
 CO4: Produce programming technique's solutions using appropriate digital tools and/or platforms. (A3, PLO6);  
 CO5: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5).

**BCN2053  
OPERATING SYSTEMS**

Credit Hour: 3

Prerequisite: None

## Synopsis:

This subject introduces the various data and control structures necessary for the design and implementation of modern computer operating systems. Memory, Processor, Concurrent, File, Device and Network Management are explored as the basic of all Operating Systems.

## Course Outcome:

By the end of semester, students should be able to:

- CO1: Demonstrate understanding of the theory and principles of operating systems (C2, PLO1);  
 CO2: Distinguish the relationship between OS and hardware which includes User command interface, Memory Management, Processor

Management, File Management, Device Management & Network Management (C3, PLO2);

CO3: Construct OS instructions via Command line and Shell Scripting (P3, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Manage relevant information from different sources related to the operating systems (A3, PLO6).

### **BCN1053**

#### **DATA COMMUNICATION & NETWORKING**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. It uses the OSI and TCP layered models to examine the nature and roles of protocols and services at the application, network, data link, and physical layers. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of basics computer networking (C2, PLO1);

CO2: Analyze process by identifying the problems in data communication. (C4, PLO2);

CO3: Construct a simple LAN topology by applying basic principles of cabling using network simulation and follow basic configuration of network design using real network devices such as switches and routers (P3, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Perform standard configuration and troubleshooting network independently (A3, PLO9),

### **BCS1043**

### **SOFTWARE ENGINEERING**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course presents an introduction to software engineering concepts including: software engineering paradigms, requirements specification, design, software verification and validation; software evolution and reliability. This course also describes the concepts and methods of information system analysis and design (structured approach), with an emphasis on system analysis methods and tools.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish the important terminology and activities involves (theoretically and practically) related to foundation concepts of software engineering and software development (C2, PLO1);

CO2: Show system design solutions (structured design approach) from a case study that comply with the stages of systems development life cycle (C3, PLO2);

CO3: Show technical solutions to a range of audience and reproduce a system design (structured design approach) from a case study that comply with the stages of systems development life cycle (P3, PLO3);

CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5);

CO5: Display an ethical and professional values in carrying out the given tasks (A3, PLO11).

### **BCI2023**

#### **DATABASE SYSTEMS**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

The course emphasizes on the importance of data to an organization and how the data should be managed. Database management system (DBMS) will be viewed as a solution to the problems of file processing system.

Aspects of relational database design will be covered in details. This includes database development life cycle, database architecture, data models, and normalization process. Structured Query Language (SQL) will be discussed and emphasized as query language in database management. Students will be given a real life problem to design and develop a database application system. In the later part of the course students will be exposed to the latest developments in database architecture.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate knowledge and understanding of the concepts, principles and applications of database systems. (C2, PLO1);

CO2: Manipulate queries using the syntax of Structure Query Language (SQL) (P4, PLO3);

CO3: Construct innovative solution through the representation of data model using ER and EER diagrams and normalize database to be implemented in database application system using SQL (C4, PLO2);

CO4: Demonstrate personal skills effectively through the punctuality and completeness of assessment submissions. (A4, PLO9);

CO5: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

### **BCI1093 DATA STRUCTURE &ALGORITHMS**

Credit Hour: 3

Prerequisite: BCI1203 PROGRAMMING TECHNIQUES

#### Synopsis:

This course is designed to expose the students to the data structures and algorithm. It provides theoretical basis in data structures and the application of data structures is based on standard algorithms. Students must also be able to transform the data structure and algorithms problems into the computer programs.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Describe the concept of data structures and algorithms. (C2, PLO1);

CO2: Analyze various types of data structures and algorithms techniques in solving a related problem. (C4, PLO2);

CO3: Construct a program by applying the data structure and algorithms techniques for a related problem. (P3, PLO3);

CO4: Communicate effectively in both written and oral forms via appropriate medium and language (A3, PLO5);

CO5: Use digital skills to find solution for a related problem (A3, PLO6).

### **BCI2313 ALGORITHMS AND COMPLEXITY**

Credit Hour: 3

Prerequisite: BCI1093 DATA STRUCTURE & ALGORITHMS

#### Synopsis:

This course covers advanced algorithms in sorting, graph theory, algorithm complexity analysis, finite state machine, regular expression and halting problem. Student will be able to analyze and evaluate the algorithms through given assessments that based on a related case study. to advanced techniques for the design and analysis of algorithms and explores variety of applications.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate basic complexity analysis to get the algorithm complexity. (C2, PLO1);

CO2: Analyze various types of algorithm techniques in solving the related problems. (C4, PLO2);

CO3: Construct a solution by applying appropriate algorithms or techniques for the related problems. (P4, PLO3);

CO4: Apply numerical knowledge which is mathematical notation to the models of computation. (C4, PLO7);

CO5: Communicate clearly and effectively to convey ideas in written and oral form. (A4,



PLO5).

### **BCS2163 OBJECT ORIENTED DESIGN AND IMPLEMENTATION**

Credit Hour: 3

Prerequisite: BCI1203 Programming  
Techniques

Synopsis:

This course introduces students to object-oriented design principles and their application using one object-oriented language. Students will also learn how to use standard notation to illustrate their designs.

Course Outcome:

By the end of semester, students should be able to:

CO1: Describe the concept of object-oriented design in object-oriented program. (C2, PLO1);

CO2: Construct object-oriented designs and describe these designs using standard software engineering notations. (C4, PLO2);

CO3: Demonstrate the ability to implement object-oriented designs in an object-oriented programming language. (P4, CLO3);

CO4: Work with available software engineering tools to manage artifacts created during the development process and programming language tools to develop object-oriented applications. (A3, PLO4);

CO5: Practice clear and effective communication to convey ideas in written and oral form using appropriate context and language. (A3, PLO5).

### **BCS2313 ARTIFICIAL INTELLIGENCE TECHNIQUES**

Credit Hour: 3

Prerequisite: BCI1093 DATA STRUCTURE &  
ALGORITHMS

Synopsis:

This course introduces student to the theory and practice of the Artificial Intelligence (AI). Student are expose to the main artificial intelligence topics including the fundamental issues, search strategies, knowledge

representation and reasoning, advanced search, agents, machine learning and robotics. Practical examples of how artificial intelligence is applied to commercial, scientific and consumer applications will be covered.

Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish the intelligent system concepts and methodologies in computer science. (C2, PLO1);

CO2: Demonstrate critical thinking ideas in intelligent system knowledge and problem-solving. (C4, PLO2);

CO3: Construct solution using intelligent system knowledge and problem solving. (P4, PLO3);

CO4: Apply numerical knowledge to the intelligent system solution. (C3, PLO7);

CO5: Communicate clearly, confidently, accurately, coherently and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5)

### **BCN2033 INFORMATION SECURITY**

Credit Hour: 3

Prerequisite: BCN1053 DATA  
COMMUNICATION & NETWORKING

Synopsis:

The course introduces the fundamentals of information security providing information security basics, purposes, various types of security attacks, implementation and discussion in the aspect of security. Topics include: foundational concepts in security, principles of secure design, threats and attacks, basics of cryptography, network securing, intrusion detection and prevention systems.

Course Outcome:

By the end of semester, students should be able to:

CO1: Understand the fundamentals of security and factors driving the need for information security (C2, PLO1);

CO2: Analyze theory and principles of information security, types of security threats, potential attacks, cryptography, firewalls, and

intrusion detection systems (C4, PLO2);  
 CO3: Construct attack and defense methods into computer and network environments (P4, PLO3);  
 CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A4, PLO5);  
 CO5: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice in the context of information security A4, PLO11).

### **BCS2173 HUMAN COMPUTER INTERACTION**

Credit Hour: 3

Prerequisite: BCS1043 SOFTWARE ENGINEERING

#### Synopsis:

This course provides an introduction to Human-Computer Interaction (HCI). HCI is concerned with understanding, designing, implementing and evaluating user-interaction with the computers so that the designers can maximize user interaction (UI) and user experience (UX). On completing this course, the students will have knowledge of the theoretical foundations of designing the interaction between humans and computers. They will also have practical experience in implementing and evaluating the interaction.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Explain theory and principles of Human Computer Interaction (C2, PLO1);  
 CO2: Distinguish intellectual independence in the application of knowledge in Human Computer Interaction field by applying critical, analytical and evaluation skills in solving the related problems (C4, PLO2);  
 CO3: Construct solution by applying appropriate techniques, skills and tools in Human Computer Interaction to solve the related problem (P4, PLO3);  
 CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5);  
 CO5: Show the ability to possess relationships and collaborative skills in managing

relationships in teams (A3, PLO4).

### **BCI3302 PROJECT MANAGEMENT & PROFESSIONAL PRACTICES**

Credit Hours: 3

Prerequisite: None

#### Synopsis:

This course exposes the student with step by step project management process inclusive of project planning, evaluation, estimation, resource allocation, monitoring and control and managing people and teams to bring about the successful completion of specific project goals and objectives. Further, the professional practice in IT and entrepreneurship elements will be introduced where the student is expected to demonstrate the professional ethic and entrepreneurship traits in his/her group projects.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish appropriately the concepts and principles of Project Management and Professional Practice. (C2, PLO1);  
 CO2: Construct a practical software project management plan and report based on Professional Practice (C4, PLO2);  
 CO3: Use appropriate software management application/tools in software project management case study. (P4, PL03);  
 CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A5, PLO5);  
 CO5: Demonstrate the element of entrepreneurship in project report (A5, PLO10).

### **BCI3283 MOBILE APPLICATION DEVELOPMENT**

Credit Hours: 3

Prerequisite: BCS2163 OBJECT ORIENTED DESIGN & IMPLEMENTATION

#### Synopsis:

This course is concerned with the

development of applications on mobile and wireless computing platforms. It explores mobile application development aspects with emphasis on the relationship between theoretical and its practical application using cases and real examples of mobile applications. Emphasis is placed on the process, tools and frameworks required to develop applications for current and emerging mobile computing devices.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish appropriately the concepts and principles of mobile application development. (C2, PLO1);

CO2: Analyze the limitations and challenges in mobile applications. (C4, PLO2);

CO3: Construct a mobile application using selected software development environment. (P4, PLO3);

CO4: Demonstrate the element of entrepreneurship in project report. (A4, PLO10);

CO5: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

### **BCI2323 WEB PROGRAMMING**

Credit Hours: 3

Prerequisite: BCI1203 PROGRAMMING TECHNIQUES, BCI2023 DATABASE SYSTEMS.

#### Synopsis:

This course introduces the essential topics of Internet programming & development of web-based applications. Students will be able to develop a dynamic web-based application by using server and client side scripting.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish the fundamentals of dynamic web based applications. (C2, PLO1);

CO2: Demonstrate thinking skills to solve specific problems with web based

applications. (C4, PLO2);

CO3: Construct a web based application prototype using HTML, web server, database and scripting language. (P4, PLO3);

CO4: Demonstrate communication effectively in written and oral form through report and presentation session. (A4, PLO5);

CO5: Demonstrate leadership skills in resources and tasks management. (A4, PLO8).

### **BUM1233 DISCRETE MATHEMATICS AND APPLICATIONS**

Credit Hours: 3

Prerequisite: None

#### Synopsis:

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focusing on providing a basic theoretical foundation for further work. Students are exposed to logic and proof techniques, set theory, elementary number of theory, functions and relations, graph, trees, modelling computations and abstract algebra. This course integrates symbolic tools, graphical concepts, and numerical calculations.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of discrete mathematics. (C2, PLO1);

CO2: Analyze mathematical problem using discrete mathematics. (C4, PLO2);

CO3: Provide solution to discrete mathematics problems arise from computer science and engineering field. (C5, PLO2).

### **BUM2413 APPLIED STATISTICS**

Credit Hours: 3

Prerequisite: None

#### Synopsis:

This course discusses on statistical problem solving methodology and descriptive statistics; sampling distribution and confidence interval; hypothesis testing;

analysis of variance (ANOVA); goodness-of-fit test and contingency tables; regression and correlation including simple and multiple linear regressions. Microsoft Excel software will be used in this course as a statistical package (other statistical packages are SPSS, R Language, S Plus, EViews and Minitab shall be used in this course).

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of statistics. (C3, PLO1);

CO2: Perform statistical analysis by using appropriate statistical theory and methodology. (C4, PLO2);

CO3: Analyze real life to solve related problem in various disciplines. (C4, PLO2).

**BUM1153**

**INTERMEDIATE MATHEMATICS**

Credit Hours: 3

Prerequisite: None

Synopsis:

This course introduces and discusses the fundamental of mathematics focusing on providing a solid theoretical foundation for further work. Student are exposed to number system, equations, inequalities and absolute value, polynomials, sequences and series, matrices and system of linear equations, functions and graphs, and trigonometric functions. This course also integrates symbolic tools, graphical concepts, and numerical calculations.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Acquire the fundamental principles of basic mathematics (C3, PLO1);

CO2: Apply the appropriate method to solve mathematical problems (C4, PLO2).

**BCS2233**

**SOFTWARE REQUIREMENT WORKSHOP**

Credit Hour: 3

Prerequisite: BCS2163 OBJECT ORIENTED DESIGN AND IMPLEMENTATION

**Synopsis:**

This course exposes the student to software requirement stages. It will concentrate on discovering and eliciting requirements techniques, languages and models for representing requirements, requirement documentation standard, handling requirement changes, managing and validating requirements and writing Software Requirement Specifications (SRS) customize from any document standard.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Understand the knowledge and principles of requirement engineering in the software development life cycle. (C2, PLO1);

CO2: Analyze and translate requirement into appropriate UML design and tool. (C4, PLO2);

CO3: Construct a comprehensive Software Requirement Specification (SRS) document according to any document standard (P3, PLO3)

CO4: Use design related tool to produce a clear visualization of requirement design. (A3, PLO6);

CO5: Present a clear and effective communication to convey ideas in both written and oral form including presentation and group discussion. (A3, PLO5).

**BCS2343**

**SOFTWARE DESIGN WORKSHOP**

Credit Hour: 3

Prerequisite: BCS2233 SOFTWARE REQUIREMENT WORKSHOP, BCS2163 OBJECT ORIENTED DESIGN & IMPLEMENTATION

**Synopsis:**

This course introduces the students to the software design. Students will be exposed to the designs of software structure to realize the given specifications through differences available patterns. The proposes software design will be documented in the Software Design Description (SDD) by following identified standard or template. To shows the correctness of the proposes design, student will realize the proposes design by implementing it with any suitable

programming languages.

Course Outcome:

By the end of semester, students should be able to:

CO1: Understand the knowledge and principles of software design in the software development life cycle. (C2, PLO1);

CO2: Analyze and construct the software design architecture for the given scenario in the Software Design Documentation format. (C4, PLO2);

CO3: Construct a system prototype that comply with the proposed software design documentation. (P3, PLO3);

CO4: Demonstrate ethical behavior and able to act professionally within the designed scenarios and practices. (A3, PLO11);

CO5: Ability to deliver idea clearly and written academic discourse which has a coherent flow that is clear and easy to comprehend. (A3, PLO5).

### **BCS2213 FORMAL METHODS**

Credit Hour: 3

Prerequisite: BUM1233 DISCRETE MATHEMATICS & APPLICATION

Synopsis:

This course is introducing Formal Methods, which can be used in developing software specification. Formal Methods is the software specification technique that is used to ensure the software or system to be developed is being validated before it is actually developed. Therefore, any bugs can be detected at early stage in order to reduce the cost of the development. Formal Methods to be introduced in formal notations using appropriate techniques, skills and tools. detected at early stage in order to reduce the cost of the development. Formal Methods to be introduced in formal notations using appropriate techniques, skills and tools.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the principles of Formal Methods in Software

Development (C2, PLO1);

CO2: Design appropriate solution using Formal Methods concepts. (C4, PLO2);

CO3: Construct the software specification in formal notation using appropriate techniques, skills and tools. (P3, PLO3);

CO4: Demonstrate ability to use appropriate formal method tools to solve the related problems (A3, PLO6);

CO5: Communicate and work effectively individual and part of team to convey ideas in written and oral form using appropriate context and language. (A3, PLO5).

### **BCS3233 SOFTWARE TESTING**

Credit Hour: 3

Prerequisite: BCS2363 OBJECT ORIENTED DESIGN & IMPLEMENTATION, BCS2343 SOFTWARE DESIGN WORKSHOP.

Synopsis:

This course is designed to provide students with in depth knowledge on software testing and its test process. The course covers the basic principles of software testing and test activities that include the test plan, test design, monitoring, implementation and test closure. The student will also learn various categories of test design techniques and methods used in both black-box and white-box testing. At the end of this course, students should be able to recognize various types and levels of testing as well as categorizing and applying software testing process & techniques.

Course Outcome:

By the end of semester, students should be able to:

CO1: Classify between various of software testing levels, software testing types and software testing approaches. (C2, PLO1);

CO2: Construct a test documentation based on the selected testing approaches to test an object (document component, system, and etc) at hands. (C4, PLO2);

CO3: Configure/code a program to perform testing process. (P3, PLO3);

CO4: Work on the test design techniques, risk analysis and reporting within test process using the existing software testing technologies (A3, PLO6);

CO5: Present a clear and effective communication to convey ideas in both written and oral form. (A3, PLO5)

**BCS3153  
SOFTWARE EVOLUTION &  
MAINTENANCE**

Credit Hour: 3

Prerequisite:

Synopsis:

This course will introduce types of maintenance as well as other issues such as economic implications, maintenance organizational structure, quality measurement, processes related to change requests and configuration management. Student will also expose on different maintenance process models such as Boehm, Osborne, Iterative enhancement and reuse-oriented models. Upon completing this class student are expected to be able to understanding the fundamental aspects of software maintenance and evolution, including concepts, techniques and process models for system evolution.

Course Outcome:

By the end of semester, students should be able to:

CO1: To demonstrate knowledge and understanding of Computer Science theory and principles specializing in software evolution and maintenance. (C2, PLO1);

CO2: Differentiate and classify the software evolution and maintenance techniques and issues. (C4, PLO2);

CO3: Examine technical and managerial problem in software evolution and maintenance. (P4, PLO3);

CO4: Search and manage relevant information from different sources related to the concept of software evolution and maintenance. (A4, PLO9);

CO5: Explain and organize the related information to justify the given idea. (A4, PLO5)

**BCS3263  
SOFTWARE QUALITY ASSURANCE**

Credit Hour: 3

Prerequisite: BCS3233 SOFTWARE TESTING

Synopsis:

This course introduces students to the concept of Software Quality Assurance (SQA) including principles, component, process, models, standards and certification of SQA. Students are required to understand the relationship between software quality assurance and software engineering.

Course Outcome:

By the end of semester, students should be able to:

CO1: Understand the knowledge of main software quality assurance activities, their tasks, work products and models (C2, PLO1);

CO2: Design a solution based on knowledge of main software quality assurance activities. (C4, PLO2);

CO3: Produce a software product quality related activities by applying ISO and IEEE standard. (P4, PLO3);

CO4: Work in a team and present the team decision/solution for a given task (A3, PLO5).

CO5: Responsible to the task given in achieving quality work. (A4, PLO9)

**BCS3473  
SOFTWARE SECURE DEVELOPMENT**

Credit Hours: 3

Prerequisite: BCS2363 OBJECT ORIENTED DESIGN & DEVELOPMENT

Synopsis:

This course is to expose students on the knowledge and technical aspect of software security especially on secure coding. Students will learn standard guideline and practices on developing secure software application. At the end of this course, student will become adapt in designing secure software application.

Course Outcome:

By the end of semester, students should be able to:

CO1: Describe knowledge on Computer Science theory and principles specializing in software security (C2, PLO1);

CO2: Expose the concept of secure code in software applications. (C4, PLO2);  
 CO3: Analyze software vulnerabilities in current software applications. (P4, PLO3);  
 CO4: Structure information collection and work in team with the software development team. (A4, PLO4);  
 CO5: Demonstrate communication effectively in written and oral form through report and presentation session. (A4, PLO5).

### **BCS2243 WEB ENGINEERING**

Credit Hours: 3

Prerequisite: BCI2323 WEB DEVELOPMENT

#### Synopsis:

This course introduces the knowledge on agile and adaptable approach in developing competitive web applications; the associated concepts, architectures, methods, techniques and frameworks. Students are required to develop a web application based on web engineering concepts.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate the fundamentals of web engineering. (C2, PLO1);  
 CO2: Design appropriate solution using web engineering concepts. (C4, PLO2);  
 CO3: Construct a dynamic web application prototype that applied front end and design patterns. (P4, PLO3);  
 CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A3, PLO5);  
 CO5: Demonstrate the use of appropriate web framework. (A3, PLO6).

### **BCS3533 SPECIAL TOPICS IN SOFTWARE ENGINEERING**

Credit Hours: 3

Prerequisite: None

#### Synopsis:

This course introduces student with the special topics in software engineering. The

course will cover the concept and methodology of the selected topics.

#### Course Outcome:

CO1: Distinguish the new concept of software engineering. (C3, PLO1);  
 CO2: Evaluate the selected software engineering concept methodologies. (C5, PLO2);  
 CO3: Construct the structural methodologies of the selected software engineering concepts. (P4, PLO3);  
 CO4: Present and advocate ideas in the selected topic. (A4, PLO5);  
 CO5: Demonstrate ability to work and solve problem for specific problem (A3, PLO9).

### **BCS3453 INTEGRATED APPLICATION DEVELOPMENT FRAMEWORK**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course covers development of applications using web, and emerging technologies with emphasis on requirements management, interface design, usability, testing, deployment, including ethical and legal considerations. This course will also make use of Laravel Framework, an application development framework that lets students easily design and deploy applications that enhance the core enterprise solution. The outcome of the course is to provide a solution to any business establishment or community that needs system in their daily activities and process.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Classify and distinguish among the processes in the integrated development environment. (C2, PLO1);  
 CO2: Organize and reproduce the solutions using the integrated development framework. (C4, PLO2);  
 CO3: Demonstrate ability to apply appropriate techniques, skills and tools in IADF to solve the related problem. (P4,

PLO3);  
CO4: Practice clear and effective communication to convey ideas in written and oral form confidently, accurately and coherently using appropriate context and language. (A3, PLO5);  
CO5: Work effectively as part of a team to propose solution using integrated development framework. (A3, PLO8).

**BCS3443  
CYBER-PHYSICAL SYSTEMS MODELLING  
AND DESIGN**

Credit Hour: 3  
Prerequisite: None

**Synopsis:**

This course introduces Cyber-Physical Systems, where physical and software components are deeply intertwined. In this course, a student will be introduced the way of CPS modelling, design and validation with different techniques and tools. At the end of the course, a student will be able to model, to design and to validate a sample of a CPS.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Demonstrate the understanding of theory and principles of a CPS design and development. (C2, PLO1);

CO2: Model and design a system with sensing, actuating and embedded processing components corresponding to CPS requirements. (C4, PLO2);

CO3: Demonstrate ability to apply appropriate techniques, skills and tools in Cyber Physical System to solve the related problem. (P4, PLO3);

CO4: Practice clear and effective communication to convey ideas in written and oral form confidently, accurately and coherently using appropriate context and language. (A4, PLO5);

CO5: Work effectively as part of a team to model and design a cyber-physical system. (A3, PLO8).

**BCS3433  
SOFTWARE ARCHITECTURE FOR**

**AUTONOMOUS SYSTEMS**

Credit Hour: 3

Prerequisite: BCS2313 ARTIFICIAL INTELLIGENCE TECHNIQUES

**Synopsis:**

This course introduces fundamental concepts of Autonomous Systems (AUS), the principles of their design and evolution. It describes algorithms of AUS, which allow to make a choice based on the assess of current situation and environment. Architectural design patterns for AUS are introduced. As a result of the course, students will be able to design a system that is capable for auto-configuration and self-organization.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Criticize software architecture for AUS based on the client's needs to achieve a needed level of autonomy. (C5, PLO2);

CO2: Design an autonomous system to meet the users' requirements. (P4, PLO3);

CO3: Demonstrate ability to apply appropriate techniques, skills and tools in autonomous system to solve the related problem. (C3, PLO1);

CO4: Communicate effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5);

CO5: Work effectively as part of a team to design an autonomous system static and run-time structure. (A4, PLO9).

**BCS3423  
INTEGRATED BUSINESS PROCESSING  
USING SAP**

Credit Hour: 3

Prerequisite: None

**Synopsis:**

This course exposes students to the integrated business processes by using SAP ERP Systems. In the first part, student are exposes to the basic knowledge of the ERP including Procurement, Fulfilment, Inventory and Material Planning process. Furthermore, in the second part, as a support for the ERP,



SAP system is introduced and student are exposes to the process of managing SAP applications as an administrator.

Course Outcome:

By the end of semester, students should be able to:

- CO1: Demonstrate knowledge and understanding of the theory and principles of Integrated Business Processes. (C2, PLO1);  
 CO2: Classify and distinguish between each business processes in their fields and how they complement each other in the term of information sharing and exchange. (C4, PLO2);  
 CO3: Navigate and organize all given business processes information and manage the SAP Application. (P3, PLO3);  
 CO4: Able to communicate clearly and effectively to convey ideas in written and oral form, confidently, accurately and coherently using appropriate context and language. (A3, PLO5);  
 CO5: Propose advice and implementation for an enterprise by using Enterprise Resource Planning concepts (A4, PLO6).

### **BCM3263 AUGMENTED REALITY**

Credit Hour: 3

Prerequisite: None

Synopsis:

This course is designed to expose to the student with the theoretical and fundamentals concept of augmented reality. The course will cover the fundamental of augmented reality concepts, history of the area, hardware technologies involved, interaction techniques, design guidelines, evaluation methods, and specific application areas. Through group assignments exposure, it also will give the students the opportunity to build a communication and leadership skills. At the end of the course, the student should be able to understand the concepts of augmented reality and utilize the skills to create their own augmented reality application.

Course Outcome:

By the end of semester, students should be able to:

- CO1: Explain the fundamental concepts of techniques, processes, technologies and equipment used in augmented reality (C2, PLO1);  
 CO2: Demonstrate intellectual independence by applying the critical and evaluation skills in the application of fundamental concepts of augmented reality within specific field (C4, PLO2);  
 CO3: Construct an augmented reality application by implementing the fundamental concepts of augmented reality. (P4, PLO3);  
 CO4: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5);  
 CO5: Demonstrate leadership by taking actions and influence others in order to achieve common goals in completing the task (A4, PLO8).

### **BCM3253 DATA ANALYTICS & VISUALIZATION**

Credit Hour: 3

Prerequisite: BCI2023 DATABASE SYSTEMS

Synopsis:

This course will expose students with various data processing stages including data acquisition, data cleansing, data modelling and data mapping and rendering. The data analytics topics cover basic descriptive and predictive analytics. While data visualization techniques cover the types of visualization, context of decision making and stakeholder identification. At the end of this course students will able to attain the learning outcomes as stated in the section of course learning outcomes.

Course Outcome:

- CO1: Describe the data processing stages for data analytics. (C2, PLO1);  
 CO2: Analyze the concept of data processing for data analytics and visualization in various applications. (C4, PLO2);  
 CO3: Construct a visualization application by implementing data analytics and visualization techniques. (P4, PLO3);

CO4: Perform the ability for independence learning using appropriate tools and platform. (A5, PLO6);

CO5: Analyze the numerical information to propose the suitable solutions to facilitate stakeholder decision making. (C4, PLO7);

CO6: Communicate clearly and effectively to convey ideas in written and oral form using appropriate context and language. (A4, PLO5).

### **BCN3273 EMBEDDED SYSTEM DESIGN AND APPLICATION**

Credit Hour: 3

Prerequisite: BCN1043 COMPUTER ARCHITECTURE & ORGANIZATION

#### Synopsis:

This course explores all the stages related to identifying a problem that is solvable through Physical System design and application. It then discusses designing and building an Internet of Things (IoT) system to solve a problem. Intended for anyone who has an interest in learning how to design and build IoT devices, this course includes activities that expand on the course material. The focus of this course is to explore the field of the things and their connection to the IoT. In this course, you will analyze the things and connections that make up the IoT, build sensor/actuator systems using the microcontroller and single-board computer and explore the use of Cloud and Fog Technology in an IoT system.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding in designing and analyzing a physical system solution. (C2, PLO1);

CO2: Analyze requirement in designing and development of a physical system solution. (C4, PLO2);

CO3: Construct physical system solution base on the design and requirements (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Identify business proposals based on a

physical system solution. (A3, PLO10)

### **BCN3233 CYBERCRIME AND FORENSIC COMPUTING**

Credit Hour: 3

Prerequisite: BCN2033 INFORMATION SECURITY

#### Synopsis:

The primary focus of this course is to give students a solid foundation by introducing computer forensics to those who are new to the field, by having the principle knowledge and skills of Computer Forensics, to successfully identify, secure, analyze and present digital evidence. This course will enable students to relate the principle and practice of computer forensic, which builds on that foundation simultaneously enhance the skills of the IT security professional. This course is intended for novices who have a thorough grounding in computer and networking basics.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding in the nature of computer crime, digital evidence, computer forensic principle, network forensics and the role of computer forensics expert. (C2, PLO1);

CO2: Analyze the evidence from the systems based on the nature of computer crime, digital evidence, computer forensic principle, network forensics and the role of computer forensics expert. (C4, PLO2);

CO3: Correlate the evidence when doing the computer forensics examination and documentation of the findings that are suitable for use in jurisdiction purpose, in both civil and criminal matters. (P4, PLO3)

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Collaborate in team to organize new idea, solving problems related to computer forensics. (A3, PLO9).

### **BCN3113 ETHICAL HACKING**

Credit Hour: 3

Prerequisite: BCN2033 INFORMATION SECURITY

#### Synopsis:

This course will immerse the student into an interactive environment where they will be shown how to scan, test, hack and secure their own systems. The lab intensive environment gives each student in-depth knowledge and practical experience with the current essential security systems. Students will begin by understanding how perimeter defenses work and then be lead into scanning and attacking their own networks, no real network is harmed. Students then learn how intruders escalate privileges and what steps can be taken to secure a system.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding of the theory and principles of Computer Science specializing in ethical hacking (C2, PLO1);

CO2: Analyze theory and principles of information security, element of security, hacking cycle, hacktivism and ethical hacking (C4, PLO2);

CO3: Construct attack and defense methods into computer and network environments. (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice by demonstrating usage of data and ethical hacking methods and tools. (A4, PLO11).

### **BCN3223 CRYPTOGRAPHY**

Credit Hour: 3

Prerequisite: BCI1203 PROGRAMMING TECHNIQUES, BCN2023 INFORMATION SECURITY

#### Synopsis:

This course covers most of the important aspects of cryptography that includes: symmetric and asymmetric cryptography, number theory. Since cryptography assists in providing accountability, fairness, accuracy, and confidentiality, it can prevent fraud in electronic commerce and assure the validity of financial transactions. It can also prove your identity or protect your anonymity.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate the understanding in fundamental knowledge of cryptography (C2, PLO1);

CO2: Analyze various cryptography algorithms and relevant mathematical theories (C5, PLO2);

CO3: Construct syntax error-free program with cryptography algorithms (P4, PLO3);

CO4: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5);

CO5: Collaborate in team to organize new idea, solving problems related to cryptography. (A3, PLO9).

### **BCI3313 IOT DATA INTEGRATION**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course focus on the management and integration of real time data from the sensors and microcontroller. Student will be introduced to several data protocols in IoT such as MQTT and HTTP. Additionally, student will experience to store IoT data relational and no-SQL databases. Student will also learn to configure and visualize data on an industrial standard to IoT Platform dashboard.

#### Course Outcome:

By the end of semester, students should able to:

CO1: Explain the theory and principles of data management and data integration in IOT. (C2, PLO1);

CO2: Demonstrate ability to propose solution in related IoT data integration problems. (C4, PLO2);  
 CO3: Construct data management and data integration solution using appropriate techniques, skills, and tools to solve the related problem in IoT. (P4, PLO3);  
 CO4: Demonstrate the ability to possess relationships and collaborative skills in managing relationships in teams. (A3, PLO8);  
 CO5: Communicate effectively to convey ideas in written and oral form through appropriate medium. (A3, PLO5).

### **BCI3323 IOT APPLICATION DEVELOPMENT**

Credit Hour: 3

Prerequisite: BCS2313 ARTIFICIAL INTELLIGENCE TECHNIQUES

#### Synopsis:

This course covering the current state of the art in Internet of Things in Smart Technology. Student will be exposed with multiple technology domains to develop an IOT system and its components and how it can help to support industry. This course focus on analyzing, designing and developing software application for industrial standard IOT application.

#### Course Outcome:

By the end of semester, students should able to:

CO1: Analyze the fundamental of IOT environment for industrial application. (C2, PLO1);  
 CO2: Construct a solution into a web application for an IOT case study using IOT data. (C5, PLO2);  
 CO3: Construct a solution to apply appropriate analytics and machine learning techniques for IOT data. (P4, PLO3);  
 CO4: Demonstrate the ability to possess relationships and collaborative skills in managing a team. (P3, PLO8);  
 CO5: Communicate effectively in both written and oral forms through appropriate medium. (P3, PLO5).

### **BCN3343**

### **INTEGRATED SYSTEM AND SENSOR APPLICATION.**

Credit Hour: 3

Prerequisite: BCS2163 OBJECT ORIENTED DESIGN & IMPLEMENTATION.

#### Synopsis:

This course student will learn the fundamental of cyber-physical systems in embedded systems. The mechanisms by which software interacts with the physical world. This course emphasized both theory and practical in utilizing microprocessors, sensors and actuators in creating a cyber-physical system through programming techniques. Through this course, students should be able to design, construct and test their own cyber-physical system as a part of IOT technology.

#### Course Outcome:

By the end of semester, student should be able to:

CO1: Demonstrate knowledge and understanding of the theory and practical of building embedded system. (C2, PLO1);  
 CO2: Propose a solution using embedded systems (C6, PLO2);  
 CO3: Develop the solution using embedded systems with appropriate tools. (P4, PLO3);  
 CO4: Demonstrate the ability to work in team through project completion. (A3, PLO8);  
 CO5: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5).

### **BCC3013 UNDERGRADUATE PROJECT I**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course aims to give students to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify and analyze the problem, propose solution, collect the required data for specific solution and conduct research on the solution. At the end, the students are able to produce a proposal that consist of the problem and proposed solution. During this course, student is supervised by

appointed supervisors that will guide and monitor the students project progress. This is to ensure that the project is within the course objective.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Propose a solution based on specific problem by following the principle of computing. (C4, PLO2);

CO2: Design the proposed solution through proof of concept by using appropriate tools. (P4, PLO3);

CO3: Demonstrate effective communication skills in written and oral form through report writing and presentation. (A4, PLO5);

CO4: Demonstrate student's ethics and professional values throughout the project completion. (A4, PLO4)..

### **BCC3024**

#### **UNDERGRADUATE PROJECT II**

Credit Hour: 3

Prerequisite: BCC3012 UNDERGRADUATE PROJECT I

#### Synopsis:

his course aims the student to develop and test their proposed solution based on their developed project proposal. Student must be able to demonstrate the ability to implement the proposed solution in their project proposal by following the principle of computing. The student must be able to validate their proposed solution using appropriate tools. At the end of this course, student are able to produce and present their validated project and completed report of their project.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate the ability to implement the proposed solution by following the principle of computing (C4, PLO2);

CO2: Develop the solution based on the approved proposal using appropriate tools. (P4, PLO3);

CO3: Validate the solution based on the approved proposal using appropriate tools.

(P4, PLO3);

CO4: Demonstrate effective communication skills in written and oral form through report writing and presentation. (A4, PLO5).

### **BCC4012**

#### **INDUSTRIAL TRAINING**

Credit Hour: 3

Prerequisite: Complete all require courses as mentioned in the Curriculum Structure.

#### Synopsis:

This course aims to give an experience for the student to apply their knowledge and skills that they have learned. During the internship duration, student must write and record all activities and tasks given by industrial supervisor in the log book. Student able to demonstrate effectively interpersonal skills and act professionally in working environment. By the end of the internship, the student must provide a final report.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Summarize the industrial training knowledge, experience and skills into appropriate report (C4, PLO2);

CO2: Construct solution by applying appropriate techniques, skills and tools to solve tasks given by industry (P4, PLO3);

CO3: Demonstrate effective interpersonal skills throughout industrial training (A4, PLO4);

CO4: Demonstrate student ethics and professional values throughout the industrial training duration (A4, PLO11);

CO5: To communicate effectively to convey ideas in written and oral form using appropriate context and language (A4, PLO5).

### **BCI3313**

#### **MACHINE LEARNING APPLICATIONS**

Credit Hour: 3

Prerequisite: BCS2313 ARTIFICIAL INTELLIGENCE TECHNIQUES

#### Synopsis:

Machine learning has become an integral part

of many applications and research projects as well in data science pipeline. This course covers the concepts and a wide range of machine learning techniques starting with examination of the data sets and explain trends, simple linear regression, support vector machines, decision tree based, data modelling and production, creating algorithms, predictive models, and basic of deep neural networks. At the end of this course, students practically build an appropriate machine learning model into a production of web application.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Explain the fundamental of the machine learning techniques. (C2, PLO1);

CO2: Demonstrate appropriate data exploratory and machine learning techniques in a given problem (C4, PLO2);

CO3: Construct an application based on appropriate machine learning models to solve the given problem. (P4, PLO3);

CO4: Demonstrate a solution using appropriate digital tools and or any platforms. (A3, PLO6);

CO5: Communicate effectively in both written and oral forms through appropriate mediums. (A3, PLO5).

emerging trends in ICT (C4, PLO1);

CO2: To organize effective approaches in gathering up-to-date information and trends in ICT (P4, PLO3);

CO3: To demonstrate effective skill in presenting emerging trends in ICT (oral) (A3, PLO4);

CO4: To demonstrate effective skill in presenting emerging trends in ICT (written) (A3, PLO4).

### **BCI3293**

#### **EMERGING TECHNOLOGY**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course addresses several emerging trends in ICT locally and globally. The issues are raised from several areas in ICT with the Industrial Revolution 4.0 (IR4.0): autonomous robots, simulation, system integration, internet of things, cybersecurity, cloud computing, additive manufacturing, augmented reality and big data.

#### Course Outcome:

By the end of semester, student should be able to:

CO1: To demonstrate understanding in the

**CURRICULUM STRUCTURE  
DIPLOMA IN COMPUTER SCIENCE**

YEAR	1					2			3	
SEMESTER	FIRST	SECOND	THIRD	FORTH	FIFTH	SIXTH				
COURSES	DUM1163 Elementary Mathematics	DRC1313 Computer Architecture & Organization	DUM1433 Discrete Structure Application	DUM1233 Discrete Mathematics Application	DRC2826 Final Year Project 2	DRC2912 Industrial Training				
	UHC1012 Falsafah dan Isu Semasa	DRC1123 Database Systems	DRC1333 Data Communication & Networking	DRC2813 Final Year Project 1	DRC2153 Mobile Application Development					
		DRC2223 Software Engineering	DRC1133 Web Programming	DRC1323 Operating Systems	DRC***3 Elective II					
		DRC1113 Programming Techniques	DRC2153 Data Structure & Algorithms	DCR1423 Fundamental of Multimedia	DRC***3 Elective III					
		UHL2442 Essential English	DRC1413 Graphical User Interface	DRC1213 Object-Oriented Design & Implementation	UHS1022 Soft Skills					
		UHC2022 Penghayatan Etika dan Peradaban	UHL2412 English for Academic Communication	DRC***3 Elective I						
		UQA1002 Ko-Kurikulum	UGE1002 Entrepreneurship	UHL2432 English for Professional Communication						
	<b>TOTAL CREDIT PER SEMESTER</b>	<b>5</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>17</b>	<b>12</b>			
	<b>91</b>	<b>OVERALL TOTAL CREDIT FOR GRADUATION</b>								

**ELECTIVE COURSE TO BE OFFER IN  
DIPLOMA IN COMPUTER SCIENCE**

NO.	CODE	COURSE	CREDIT HOUR
1	DRC1143	Emerging Technologies	3
2	DRC2173	Web Application Technology	3
3	DRC2343	Data and Network Security	3

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	<b>Knowledge</b> ICT practitioner who are competent, practice professionalism and contribute to the digital world agenda in the organization, entrepreneur and/or community across difference domain application areas.
PEO2	<b>Adaptability</b> ICT practitioner acquire to continue enhancing the competency, leadership, and self-development to strengthen/advanced their career to contribute for the nation development.
PEO3	<b>Leadership</b> ICT practitioner who demonstrates the commitment to the profession as well as community, holding responsible that can contribute to the well- being of the society.

PROGRAMME LEARNING OUTCOMES (PLO)	
PLO1	Demonstrate knowledge and understanding of the theory and principles of Computer Science specializing in Computer Systems & Networking (Knowledge and Understanding)
PLO2	Demonstrate knowledge and understanding of the theory and principles of Computer Science specializing in Computer Systems & Networking (Cognitive Skills)
PLO3	Apply appropriate techniques, skills and tools in computer science practices specializing in Computer Systems & Networking to understanding the body of knowledge and/or solve a problem. (Practical Skills)
PLO4	Demonstrate the ability to possess relationships and collaborative skills in managing relationships in teams and within the organizations (Interpersonal Skills)
PLO5	Communicate clearly and effectively to convey ideas in written and oral form, confidently, accurately and coherently using appropriate context and language. (Communication Skills)
PLO6	Choose/use appropriate technology to support/solve the problem at hands (Digital Skills)
PLO7	Apply mathematical and other quantitative, qualitative tools to analyze and evaluate numerical & graphical / visual data for solving problem in the real context. (Numerical Skills)
PLO8	Demonstrate autonomous leadership skill to the assigned responsibilities in a team. (Leadership, Autonomy and Responsibility)
PLO9	Student possess the ability to manage themselves effectively and engage effectively in self-directed lifelong learning for achieving self-sustainability, competitiveness and employability. (Personal Skills)
PLO10	Demonstrate entrepreneurial thinking and innovational thinking within the field of computer science (Entrepreneurship Skills)
PLO11	Demonstrate ethical behavior and act professionally within the varied environment and practice. (Ethics and Professionalism)



**COURSE SYNOPSIS****DRC1313  
COMPUTER ARCHITECTURE &  
ORGANIZATION**

Credit Hour: 3

Prerequisite: None

**Synopsis:**

This course discusses the component, structure and function of a computer. It exposes student with the architecture and organization of a computer. This subject covers on the numbering system, data representation, the internal and external computer communication through system buses and Input/Output, computer storage, internal architecture of Central Processing Unit, Logic Gates and Boolean Algebra. Assembly languages are expose to student for better understanding of the computer structure and its component.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Classify and illustrate the internal and external components of a computer structure and its functionality which include CPU, buses, memory and I/O. (C3, PLO2);

CO2: Display and calculate the different machine data level representation, arithmetic and write a assembly language code to show computer inner working behaviour. (P2, PLO3)

CO3: Demonstrate team working element by solving problems of computer architecture and organization in a group. (A2, PLO5).

**DRC1413  
GRAPHICAL USER INTERFACE**

Credit Hour: 3

Prerequisite: None

**Synopsis:**

This course introduces the standard Graphical User Interface (GUI) using usability-engineering life cycle for any software system and application. Student

will expose to the concept of graphical user interface for computer application and how to design good user interface based on the usability heuristic concept.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Classify the Graphical User Interface (GUI) in various types of software. (C3, PLO2);

CO2: Construct a GUI prototype according to the user interface guidelines. (P3, PLO3);

CO3: Work and communicate effectively in group to complete the given assessment in specific time given. (A3, PLO5).

**DRC1123  
DATABASE SYSTEMS**

Credit Hour: 3

Prerequisite: None

**Synopsis:**

The course emphasizes on the importance of data to an organization and how the data should be managed. Database management system (DBMS) will be viewed as a solution to the problems of file processing system. Aspects of relational database design will be covered in details. This includes database development life cycle, database architecture, data models, and normalization process. Several query languages such as Structured Query Language (SQL) and Query by Example (QBE) will be discussed but the emphasis is on SQL. Students will be given a real-life problem to design and develop a database application system. In the later part of the course students will be exposed to the latest developments in database architecture.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Distinguish appropriate concepts, principles and applications of database systems. (C2, PLO1)

CO2: Manipulate queries using the syntax of Structure Query Language (SQL) and Query by Example. (P2, PLO3)

CO3: Construct innovative solution through the representation of data model, relationship ER and EER Diagrams and database normalization in database application system using appropriate DBMS. (C4, PLO2);

CO4: Work in group in order to complete the given assessments in specific time frame (A3, PLO5).

### **DRC1113 PROGRAMMING TECHNIQUES**

Credit Hour: 3

Prerequisite: None

#### **Synopsis:**

This course discusses on understanding problems and translating them into computer solution techniques using programming language. This course enables students to apply programming techniques, write programming codes from given problems and execute programming codes successfully.

#### **Course Outcome:**

By the end of semester, students should be able to:

CO1: Demonstrate appropriate programming techniques in solving a given problem. (C3, PLO2);

CO2: Construct a syntax error free program. (P3, PLO3);

CO3: Prepare programming technique's solution using appropriate digital tools and platform. (A2, PLO6).

### **DRC1333 DATA COMMUNICATION & NETWORKING**

Credit Hour: 3

Prerequisite: None

#### **Synopsis:**

This course introduces the architecture, structure, functions, components, and models of the Internet and other computer

networks. It uses the OSI and TCP layered models to examine the nature and roles of protocols and services at the application, network, data link, and physical layers. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum.

#### **Course Outcome:**

By the end of semester, students should be able to:

CO1: Demonstrate knowledge and understanding of basics computer networking. (C2, PLO1);

CO2: Construct a simple LAN topology by applying basic principles of cabling using network simulation and follow basic configuration of network design using real network devices such as switches and routers. (P3, PLO3)

CO3: Perform standard configuration and troubleshooting network independently. (A2, PLO4).

### **DRC1133 WEB PROGRAMMING**

Credit Hour: 3

Prerequisite: DRC1113 PROGRAMMING TECHNIQUES, DRC1123 DATABASE SYSTEMS

#### **Synopsis:**

This course introduces the essential topics of Internet programming & development of web-based applications. Students are required to develop a web/Internet application which connected to the database.

#### **Course Outcome:**

By the end of semester, students should be able to:

CO1: Apply the fundamentals of dynamic web-based applications. (C3, PLO2);

CO2: Construct a web-based application prototype using HTML, web server, database and scripting language. (P3, PLO3);

CO3: Demonstrate communication effectively in written and oral form through group discussion, meeting and presentation session. (A2, PLO5).

**DRC1323**  
**Operating SYSTEMS**

Credit Hour: 3

Prerequisite: None

Synopsis:

This subject introduces the various data and control structures necessary for the design and implementation of modern computer operating systems. Memory, Processor, Concurrent, File, Device and Network Management are explored as the basic of all Operating Systems.

Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish the relationship between OS and hardware (User command interface, Memory Management, Processor Management, File Management, Device Management & Network Management). (C3, PLO2);

CO2: Construct & manipulate OS instructions via Command line and Shell Scripting. (P3, PLO3);

CO3: Search and manage relevant information from different sources related to the operating systems. (A2, PLO6).

**DRC2163**  
**DATA STRUCTURE & ALGORITHMS**

Credit Hour: 3

Prerequisite: DRC1113 PROGRAMMING TECHNIQUES

Synopsis:

This course is designed to expose the students to the data structures and algorithm. It provides theoretical basis in data structures and the application of data structures is based on standard algorithms. Students must also be able to transform the data structure and algorithms problems into

the computer programs.

Course Outcome:

By the end of semester, students should be able to:

CO1: Analyse various types of data structures and algorithms techniques in solving a related problem. (C4, PLO2);

CO2: Construct a programme by applying the data structure and algorithms techniques for a related problem. (P3, PLO3);

CO3: Use digital skills to find solution for a related problem. (A3, PLO6).

**DRC1143**  
**EMERGING TECHNOLOGIES**

Credit Hour: 3

Prerequisite: None

Synopsis:

This course addresses several emerging trends in ICT locally and globally. The issues are raised from several areas in ICT with the Industrial Revolution 4.0 (IR4.0): autonomous robots, simulation, system integration, internet of things, cybersecurity, cloud computing, additive manufacturing, augmented reality and big data.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrate understanding in the emerging trends in ICT. (C2, PLO1);

CO2: Describe and evaluate emerging technology and its impact on organization and industries. (C4, PLO2);

CO3: Organise effective approaches in gathering up-to-date information and trends in ICT. (P3, PLO3);

CO4: Demonstrate effective skill in presenting emerging trends in ICT (oral) (A3, PLO5);

CO5: Demonstrate effective skill in presenting emerging trends in ICT (written) (A3, PLO5).

**DRC2173**  
**WEB APPLICATION TECHNOLOGY**

Credit Hour: 3

Prerequisite: DRC1113 PROGRAMMING TECHNIQUES, DRC1123 DATABASE SYSTEMS, DRC1133 WEB PROGRAMMING

Synopsis:

This course provides students with the knowledge and skills that are needed to develop web application. Students learn data access from database to web application, create and utilize web services, create component and deploy application. The students will implement what they have learned in a mini project.

Course Outcome:

By the end of semester, students should be able to:

CO1: Apply the fundamentals of web-based applications within the context of framework technology. (C3, PLO2);  
CO2: Manipulate web service components, configuration, securing and deployment in web application. (P3, PLO3);  
CO3: Demonstrate communication effectively in written and oral form through group discussion, meeting and presentation session. (A3, PLO5).

**DRC2343**  
**DATA & NETWORK SECURITY**

Credit Hour: 3

Prerequisite: DRC1333 DATA COMMUNICATION & NETWORKING

Synopsis:

The course introduces fundamental of security. Every chapter will explain security concepts, fundamentals, purpose, implementation and discussion in their respective areas related to data and network security.

Course Outcome:

By the end of semester, students should be able to:

CO1: Analyse theory and principles of information security, types of security threats, potential attacks, cryptography, firewalls, and intrusion detection systems. (C4, PLO2);

CO2: Construct and organize attack and defence methods into computer and network environments.

Construct attack and defence methods into computer and network environments. (P3, PLO3);

CO3: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice in the context of information security. (A3, PLO11).

**DRC1423**  
**FUNDAMENTAL OF MULTIMEDIA**

Credit Hour: 3

Prerequisite: None

Synopsis:

This course will expose students to the theoretical and fundamental concepts of multimedia, its applications and the techniques involved. Topics to be covered include text and audio, image and video, the art of multimedia, and multimedia over the network.

Course Outcome:

By the end of semester, students should be able to:

CO1: Demonstrates conceptual understanding and knowledge in multimedia, functions of each multimedia element, its usage and processing technique. (C3, PLO2);

CO2: Manipulate multimedia elements (text, graphic, audio, video & animation) using software tools. (P3, PLO3);

CO3: Recognize the issues in context of multimedia technology and able to adapt to other related fields. (A2, PLO11).

**DRC2813**  
**FINAL YEAR PROJECT I**

Credit Hour: 3

Prerequisite: None

**Synopsis:**

This course aims to give chances for the student to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify problem, analyse the problem, give general solution, collect the required data regarding specific solution and do research on the solution. Finally, student will be able to produce proposal report and solve the problem identified. During the course, student will be supervised by their supervisor in order to guide and monitor the students' project progress and to ensure that they can achieve the course objective.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Propose a solution based on specific problem by following the principle of software development process. (C5, PLO2);

CO2: Design the proposed solution through prototype by using appropriate tools. (P3, PLO3);

CO3: Demonstrate effective communication skills in written and oral form through report writing and presentation. (A3, PLO5);

CO4: Demonstrate student's ethics and professional values throughout the project completion. (A2, PLO11).

**DRC2826**  
**FINAL YEAR PROJECT II**

Credit Hour: 6

Prerequisite: DRC2813 FINAL YEAR PROJECT 1

**Synopsis:**

This course aims to give chances for the student to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify problem, analyse the problem, give general solution, collect the required data regarding specific solution

and do research on the solution. Finally, student will be able to produce proposal report and solve the problem identified. During the course, student will be supervised by their supervisor in order to guide and monitor the students' project progress and to ensure that they can achieve the course objective.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Demonstrate the ability to implement the proposed solution by following the principle of software development process. (C3, PLO2);

CO2: Develop and testing the solution based on the approved proposal using appropriate tools by following the principle of software development process. (P3, PLO3);

CO3: Demonstrate effective communication skills in written and oral form through report writing and presentation. (A2, PLO5);

CO4: Demonstrate student's ethics and professional values throughout the project completion. (A2, PLO11).

**DRC1213**  
**OBJECT-ORIENTED DESIGN & IMPLEMENTATION**

Credit Hour: 3

PREREQUISITE: DRC1113  
 PROGRAMMING TECHNIQUES

**Synopsis:**

This course introduces students to object-oriented design principles and their application using one object-oriented language. Students will also learn how to use standard notation to illustrate their designs.

**Course Outcome:**

CO1: Able to interpret the object-oriented design into an object-oriented program. (C3, PLO2);

CO2: Construct object-oriented designs and describe these designs using standard

software engineering notations. (P3, PLO3);  
 CO3: Demonstrate the ability to implement object-oriented designs in an object-oriented programming language. (A2, PLO4);  
 CO4: Use available software engineering tools to manage artefacts created during the development process and programming language tools to develop object-oriented applications. (A2, PLO6).

### **DRC2153**

#### **MOBILE APPLICATION DEVELOPMENT**

Credit Hour: 3

Prerequisite: DRC1214 OBJECT ORIENTED DESIGN & IMPLEMENTATION

#### Synopsis:

This course is concerned with the development of applications on mobile and wireless computing platforms. It explores mobile application development aspects with emphasis on the relationship between theoretical and its practical application using cases and real examples of mobile applications. Emphasis is placed on the process, tools and frameworks required to develop applications for current and emerging mobile computing devices.

#### Course Outcome:

CO1: Analyse the limitations and challenges in mobile applications. (C4, PLO2);  
 CO2: Construct a mobile application using selected software development environment. (P3, PLO3);  
 CO3: Demonstrate ability to recognize and respect group member's attitude, act and belief. (A3, PLO4).

### **DRC2223**

#### **SOFTWARE ENGINEERING**

Credit Hour: 3

Prerequisite: None

#### Synopsis:

This course presents an introduction to software engineering concepts including: software engineering paradigms, requirements specification, design, software verification and validation; software evolution and reliability. This course also describes the concepts and methods of information system analysis and design (structured approach), with an emphasis on system analysis methods and tools.

#### Course Outcome:

At the end of the semester, student should able to:

CO1: Distinguish the important terminology and activities involves (theoretically and practically) related to foundation concepts of software engineering and software. (C2, PLO1);  
 CO2: Show technical solutions to a range of audience and reproduce a system design (structured design approach) from a case study that comply with the stages of systems development life cycle. (P3, PLO3);  
 CO3: Work effectively in group and promote leadership's skills through effective communication either in written, oral form, presentation and group discussion. (A3, PLO5).

### **DRC2912**

#### **INDUSTRIAL TRAINING**

Credit Hour: 12

Prerequisite: PASSED ALL REQUIRE COURSES AS STATED IN THE CURRICULUM STRUCTURE.

#### Synopsis

During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Then, student need to provide industrial training report to describe their technical and personal development during their placement. The industrial training report need to hand in to the university supervisor. Students also need to do final presentation for assessment.

Course Outcome:

By the end of the semester, student should able to:

CO1: Adapt working culture in ICT related industry. (C2, PLO1);

CO2: Construct solution by applying the theory learned to solved real problem in organization. (C4, PLO2);

CO3: Build communication skills through oral presentation and appropriate written report. (A3, PLO4);

CO4: Work effectively with good critical thinking and problem solving in organization to perform task given. (P3, PLO3);

CO5: Practise interpersonal skills and professional ethics in organization. (A2, PLO8);

CO6: Increase the knowledge related to entrepreneurship and business operations. (A2, PLO10).







# **FACULTY OF CHEMICAL AND PROCESS ENGINEERING TECHNOLOGY**

**COURSE INFORMATION 2022-2023**

## CURRICULUM STRUCTURE BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY WITH HONOURS

Semester	First Year		Second Year		Third Year		Fourth Year	
	First	Second	First	Second	First	Second	First	Second
	BTK1153 Professional Ethics & Society	BTK1143 Physical Chemistry	BTK2214 Computer Programming for Technologist	BTK2252 Mass Transfer	BTK3214 Separation Process I	BTK3254 Environmental & Sustainable Technology	BTK4214 Plant Automation	BTK4912 Industrial Training
	BTK1113 Analytical Chemistry	BTK1224 Static & Strength of Materials	BTK2223 Chemical Process Principles	BTK2263 Heat Transfer	BTK3223 Plant Utilities	BTK3263 Separation Process II	BTK4224 Plant Troubleshooting and Maintenance	
	BTK1132 Chemistry Laboratory	BTK1253 Thermodynamics	BTK2232 Electrical Technology	BTK2274 Computer Aided Design and Process Simulation	BTK3253 Process Management and Economics	BTK3274 Process Instrumentation and Control	BTK4716 Final Year Project II	
	BTK1163 Organic Chemistry	BTK1243 Fluid Mechanics	UGE2002 Technopreneurship	BTK2244 Numerical Methods	BTK3243 Chemical Plant Safety	BTK3714 Final Year Project I	BTK38*3 Elective III	
<b>COURSES</b>	UHC1012 Falsafah dan Isu Semasa	BUM2113 Applied Mathematics	UHL2422 English for Technical Communication	BTK2284 Chemical Reactor Technology	BTK38*3 Elective I	BTK38*3 Elective II		
	BUM1223 Calculus	UHL2412 English for Academic Communication	BUM2413 Applied Statistics	UHL2432 English for Professional Communication	UHF2021 Foreign Language II			
	UQA2**2 Co-Curriculum		UHF1011 Foreign Language I		UHC2022 Ethnic Relations			
			UHS1022 Soft Skills					
<b>TOTAL CREDIT PER SEMESTER</b>	<b>18</b>	<b>18</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>18</b>	<b>17</b>	<b>12</b>
<b>OVERALL TOTAL CREDIT FOR GRADUATION</b>	<b>140</b>							

**ELECTIVE COURSES FOR  
BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY WITH HONOURS**

No	Code	Course	Credit Hour
1	BTK3873	Operation Management	3
2	BTK3843	Food Engineering Technology	3
3	BTK3863	Oleo Chemical Technology	3
4	BTK3813	Petroleum Refining & Petrochemical Technology	3
5	BTK3823	Bioprocess Technology	3
6	MKK7313	Chemical Product Design & Management	3
7	MKK7183	Managing Business Intelligence	3
8	MKK7173	Finance For Entrepreneurship Decision	3
9	MKK7163	Catalytic Reaction Engineering	3
10	MPP7143	Logistics and Operation Management	3
11	MPP7113	Project Management	3
<b>Total Credit Hours (3 Courses)</b>			<b>9</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Graduates who are able to apply science and engineering technology in solving problems related to chemical engineering technology
PEO2	Graduates who practice their chemical engineering technology knowledge in process plant.
PEO3	Graduates who display leadership qualities in their workplace
PEO4	Graduates who engage life-long learning and demonstrate strong ethical values towards society and environment.

**PROGRAMME LEARNING OUTCOMES (PLO)**

<b>PLO1</b>	<b>Cognitive Domain</b> Knowledge: apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to defined and applied engineering procedures, processes, systems or methodologies (C)
<b>PLO2</b>	<b>Cognitive Domain</b> Problem analysis: Identify, formulate, research literature and analyses broadly-defined engineering problems reaching substantiated conclusions using analytical tools appropriate to their discipline or area of specialization (C)
<b>PLO3</b>	<b>Cognitive Domain</b> Development of solutions: Design solutions for broadly-defined engineering technology problems and contribute to the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (C)
<b>PLO4</b>	<b>Psychomotor Domain</b> Investigation: Conduct investigations of broadly-defined problems; locate, search and select relevant data from codes, databases and literature, design and conduct experiments to provide valid conclusions (P)

<b>PLO5</b>	<b>Psychomotor Domain</b> Modern Tool Usage: Select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to broadly-defined engineering activities, with an understanding of the limitations (P)
<b>PLO6</b>	<b>Affective Domain</b> The Engineer and Society: Demonstrate understanding of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technology practice (A)
<b>PLO7</b>	<b>Affective Domain</b> Environment and Sustainability: Understand the impact of engineering technology solutions in societal and environmental context and demonstrate knowledge of and need for sustainable development (A)
<b>PLO8</b>	<b>Affective Domain</b> Ethics: Understand and commit to professional ethics and responsibilities and norms of engineering technology practice (A)
<b>PLO9</b>	<b>Affective Domain</b> Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse technical (A)
<b>PLO10</b>	<b>Affective Domain</b> Communications: Communicate effectively on broadly-defined engineering activities with the engineering community and with society at large, by being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions (A)
<b>PLO11</b>	<b>Affective Domain</b> Project Management and Finance: Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member and leader in a team and to manage projects in multidisciplinary environments (A)
<b>PLO12</b>	<b>Affective Domain</b> Lifelong Learning: Recognize the need for and have the ability to engage in independent and life-long learning in specialist technologies (A)

**COURSE SYNOPSIS****BACHELOR OF CHEMICAL  
ENGINEERING TECHNOLOGY WITH  
HONOURS****BTK1113  
Analytical Chemistry**

## Synopsis

The syllabus covers the basic knowledge and application of sample and data handling, calibration techniques, data evaluation and quality of analysis in analytical laboratory. It also deals with separation techniques and its basic application such as GC and HPLC. The introduction to the theory and application of spectroscopic techniques used in chemical analysis such as UV-Vis and FT-IR are discussed. The student also will assigned in group to analyse a sample and prepare a report for the laboratory work.

## Course Outcomes

- CO 01 Describe the concepts of analytical chemistry and evaluate the analytical data.  
 CO 02 Solve problem related to basic analytical chemistry concepts such as gravimetry and titration.  
 CO 03 Explain the concept and application of analytical equipment such as GC, HPLC, UV-Vis and FTIR.  
 CO 04 Practically recognize analytical equipment based on the theories learn in class.

**BTK1213  
Professional Ethics & Society**

## Synopsis

This subject introduce to the students about engineering technologist profession, behaviour, professionalism and ethics as professional. Those are very important in their careers as engineering technologist or technical executive as well as their services given to public or to the community. The topics in this subject are engineering technology overview, engineering

technologist as a profession, engineering ethics, communication, management skill, philosophy of engineering, engineering contribution and innovation in engineering. This knowledge and skill might be required in their future career to ensure their services give a positive impact to the society. By completing this subject the student should understand the professional body involved in their careers and also understand how to obtain the professional membership in the future. In this subject also required the student to expose to the community/charity activities. The student required to propose their community service works by utilizing their knowledge/skill in sciences & technology.

## Course Outcomes

- CO 01 Appraise the knowledge in societal, legal and environmental issues in the contexts of engineering technologist.  
 CO 02 Valuing the relationship between science, technology and engineering  
 CO 03 Adapt ethical competent, well performed and understand the engineering ethics philosophy.

**BTK1132  
Chemistry Lab**

## Synopsis

In chemistry laboratory the students are responsible to conduct the basic physical, organic and analytical chemistry experiments such as solubility, miscibility, chemical equilibrium, buffer and pH changes, calorimetry, solvent extraction, gravimetric, UV-VIS spectrometer, FTIR, DSC and gas chromatography. At the end of experiments, the students should be able to inculcate the critical thinking and able to work in safe working condition.

## Course Outcomes

- CO 01 Applied all physical, organic & analytical chemistry theory in laboratory  
 CO 02 Practice all the basic science and analytical chemistry knowledge in

operation of analytical chemistry equipment.

CO 03 Demonstrate each analytical equipment base on the theories applied in analytical chemistry

CO 04 Revise any minor/major malfunction of equipment, incorrect step/result & troubleshoot it

### **BTK1143** **Physical Chemistry**

#### Synopsis

This course discusses some introductory to thermodynamics in physical chemistry followed by continuation topics related to liquids and their mixtures, principles of chemical equilibrium and rate of reactions. The solid surfaces including their applications will also be discussed in this course. The development of key skills is facilitated by a program of tutorials and practical.

#### Course Outcomes

CO 01 Explain the principles of thermodynamics and surface phenomenon concept related to applied physical chemistry.

CO 02 Apply and analyze the basic thermodynamics and surface phenomenon concept to solve the problem

CO 03 Ability to communicate effectively and presenting in related with thermodynamic and surface phenomenon

### **BTK1243** **Fluid Mechanics**

#### Synopsis

This module will introduce students to the principles of fluid mechanics. Students will apply these principles to the solution of engineering problems such as pipe sizing and the selection of system components such as valves and pumps. The module goal is to enable the student to develop the knowledge and analytical skills in solving

practical problems of fluid mechanics, through applications to system design and performance studies.

#### Course Outcomes

CO 01 Apply the fluid principles, Bernoulli's equation, continuity equation, fluid properties in various applications.

CO 02 Analyse the fluid systems in real pipe line systems and fluid machines.

CO 03 Demonstrate theoretical and experimental data in oral presentation and written lab report in order to understand the fundamental concept of fluid mechanics.

### **BTK1253** **Thermodynamics**

#### Synopsis

This subject is designed to introduce the basic concept in thermodynamics. Topics that will be covered in this subject include the properties of pure substances, thermodynamics system, the First Law of Thermodynamics for closed systems, open systems and their application in steady-flow and unsteady-flow processes, The Second Law of Thermodynamics, entropy, introduction to refrigeration, heat engine, and heat pump.

#### Course Outcomes

CO 01 Discover the state of properties from property diagram and obtaining data from property table.

CO 02 Solve energy balance for both closed and open system using the First Law of Thermodynamics.

CO 03 Analyze cyclic devices (heat engine, heat pump and refrigerator), steady flow devices and isentropic processes using the Second Law of Thermodynamics  
CO 04 Recognize the relationship between thermodynamics behavior and properties via experimental work and laboratory report.

### **BTK1163**

## Organic Chemistry

### Synopsis

This course discusses the fundamental theory of the properties, synthesis and organic reactions where use the functional group as framework as a basic level courses with an organic chemical content. It is also focuses on the key concepts of organic chemistry through a study of the reactions of selected nonfunctional and functional groups. Emphasis is placed on the underlying mechanistic pathways that are involved and the stereochemistry of the molecular structure is also considered.

### Course Outcomes

CO 01 Explain the common organics structures, properties , synthesis and reactions of aliphatic hydrocarbons and alcohol groups.

CO 02 Demonstrate the properties, chemicals reactions and steps of mechanism for the synthesis of aromatic hydrocarbons, carbonyl groups and amine  
CO 03 Construct the synthesis of organic compounds and identification of their functional groups.

CO 04 Present the compounds that have been synthesize and their applications in team.

## **BTK1224 Static & Strength of Materials**

### Synopsis

This subject will introduce students with concept of statics and strength of materials and its application in related engineering field. The topics covered in this subject are static of particle, static of rigid and deformable bodies, distributed forces, analysis of structure, and stress, strain & deformation. Four laboratory works will be assigned in this subject. By completing the course, students will comprehend the basic mechanisms and applications of statics and strength of materials in related engineering field.

### Course Outcomes

CO 01 Apply the basic concepts in statics to solve problems concerning resultant of forces acting on a particle and equilibrium of a particle.

CO 02 Analyse problems involving the equilibrium of a rigid and deformable bodies and use the fundamental principles in statics to solve them.

CO 03 Analyse the internal forces, moment and deformation in materials resulting from the axial stress and strain.

CO 04 Apply the relationship between material behavior and properties via experimental work and laboratory report

## **BTK2232 Electrical Technology**

### Synopsis

This course is designed to introduce the electrical system principles and electrical hazards. The principles that will be covered in this course includes Ohm's law, Kirchhoff's law, current divider rule and circuit analysis. Students are also expose to the principle of transformer and bridge circuit for instrumentation. A part of that, students are also need to carry out a simple project in order to assess their understanding on the basic electrical principles.

### Course Outcomes

CO 01 Describe the concepts of electrical

CO 02 Analyze electrical circuit problems.

CO 03 Analyze bridge circuit for instrumentation.

CO 04 Recognise the concepts of electrical principle using AC/DC electrical system and circuit simulator.

## **BTK2214 Computer Programming for Technologist**

### Synopsis

This module will introduce students to

programming course that uses MATLAB to illustrate general concepts in computer science and programming. MATLAB is a special-purpose language that is an excellent choice for writing moderate-size programs that solve problems involving the manipulation of numbers. The design of the language makes it possible to write a powerful program in a few lines. Student will become familiar with general concepts in computer science, gain an understanding of the general concepts of programming, and able to apply the knowledge to troubleshoot/diagnose and maintain computer system involving related engineering equipment computer interfaces.

#### Course Outcomes

CO 01 Identify the programming platform environment, built-in functions, user defined functions, and etc for computer programming in application software.

CO 02 Demonstrate basic programming concepts and skills needed for basic problem solving using application software.

CO 03 Demonstrate the ability to develop and execute a functional written computer program.

### **BTK2223 Chemical Process Principles**

#### Synopsis

This course aims to equip students with basic chemical engineering principles such as different unit systems, unit conversion and process variables determination. This knowledge will then be applied extensively for material and energy balances for single or multiple unit operations of non-reactive and reactive chemical processes.

#### Course Outcomes

CO 01 Solve the variables and properties related to material and energy balance problems.

CO 02 Analyze the material balance of process nonreactive and reactive systems.

CO 03 Analyze the energy balance of process nonreactive and reactive systems.

CO 04 Able to measure the concepts of mass and energy balance data obtained from the laboratory experiments

### **BTK2244 Numerical Methods**

#### Synopsis

This subject teaches the techniques by which mathematical problems are formulated so that they can be solved with arithmetic operations. Topics covered in this subject are roots of equation, systems of linear algebraic equations, optimisation, curve fitting, numerical differentiation & integration, ordinary differential equation and partial differential equation. Some software packages are introduced to empower the students in problem solving.

CO 01 Analyze a process employing numerical methods.

CO 02 Apply numerical methods as a problem-solving tool.

CO 03 Construct optimisation & numerical methods problem by using software packages

### **BTK2252 Mass Transfer**

#### Synopsis

The objective of this course is to provide students with the concepts and principles of mass transfer. This course will emphasize on the principles of the mass transfer in gases, liquids, biological solutions and gels, and solids. Subsequently, the principles of unsteady-state convective mass transfer will be covered at the end of the course. The students will be exposed to the procedure for general problem solving and its application on real system.

#### Course Outcomes

CO 01 Demonstrate an understanding of the concept of mass transfer in diffusion phenomena in gas, liquid, solid, biological



solution and gel systems.

CO 02 Solve problems related to diffusion and convection mass transfer in steady/unsteady state system.

CO 03 Practice the concept of mass transfer in problems related to unit operation/equipment.

### **BTK2284** **Chemical Reactor Technology**

#### Synopsis

This course introduces brief history and fundamental principles of chemical reactor operations. The use of process variable, stoichiometry and conversion as the important criteria for production aims and reactor operations will be thoroughly discussed. Students will be introduced to various types of traditional and modern reactors such as batch reactors, CSTR, PFR, PBR, Fluidized Bed Reactor, Biochemical Reactors and Membrane Reactors, and their applications in various types of chemical industries. Operational limitations such as complex flow patterns resulting in non-ideal operation of reactor and how to assess them will also be explained. Additionally, detailed information on non-isothermal reactor will be provided with the spirit to support and encourage better energy management as well as safe operation of chemical reactors.

#### Course Outcomes

CO 01 Explain the fundamental principle of the operation of chemical reactors in brief towards the development of modern technology used in chemical industries. CO 02

Relate the use of process variables, stoichiometry and conversion in chemical reactor technology specifications.

CO 03 Compare the performance of different types of reactors for different chemical process industries.

CO 04 Assess the performance of a non-ideal reactors based on experimental data.

CO 05 Display competency in running bench scale and pilot scale reactors.

### **BTK2263** **Heat Transfer**

#### Synopsis

The objective of this course is to provide students with the concepts and principles of heat transfer. This course will emphasize on the principles of the heat transfer in steady state by conduction, convection and radiation. Students will be exposed for general problem solving and its application on heat exchanger. Three laboratory works on shell & tube heat exchanger and plate heat will be assigned to this subject. Subsequently, the principles of unsteady-state convective heat transfer will be covered at the end of the course.

#### Course Outcomes

CO 01 Analyze problems related to the heat transfer principles and fundamentals in steady state and unsteady state.

CO 02 Apply the concept of heat transfer in problems related to unit operation/equipment (heat exchanger).

CO 03 Relates the principle of heat transfer individually and in team

### **BTK2274** **Computer Aided Design And Process Simulation**

This course is introducing the usage of CAD software, AUTOCAD. Students will be exposed and be familiar with the software environment and utilizing the basic and advanced tools to come out with a standard technical drawing especially in chemical engineering equipment.

CO 01 Demonstrate fundamentals knowledge of CAD software by identifying the capabilities, limitations and procedures for different applications.

CO 02 Analyze the use of various techniques and tools of CAD software in general technical drawing and process simulation.

CO 03 Ability to use the CAD software in basic and advanced working tools mode to create complex technical drawing and

basic process simulation.

CO 04 Demonstrate to use of the CAD software effectively in solving problems related to technical drawings for chemical engineering equipments and simulation of selected chemical engineering processes.

### **BTK3243** **Chemical Plant Safety**

#### Synopsis

This course is primarily to expose students with the fundamental concepts, practical aspects and applications of occupational safety and health (OSH) management in process industries. Among others, the students will be taught the OSH legislations that one industry should comply with in order to ensure a safe workplace environment. Students will also be taught on risk assessment through proper safety management, as well as analysing the cause and effects of industrial accidents and proposing for improvement.

#### Course Outcomes

CO 01 Value fundamentals of technical safety and occupational health in process industries.

CO 02 Explain the various features of safety and health management and legislations.

CO 03 Evaluate OSH aspects in the design and operation of process industries and propose for improvement.

### **BTK3214** **Separation Process I**

#### Synopsis

The objective of this course is to provide students with concepts of separation processes and unit operation in chemical engineering. It will cover the gas-liquid, vapor-liquid and liquid-liquid separation process. By completing the subject, students will understand the basic mechanisms, operations and basic operating parameters of the selected unit

operations such as evaporation, distillation, absorption, liquid extraction and leaching.

#### Course Outcomes

CO 01 Analyse the mechanism of mass transfer, heat transfer, material and energy balance to the major unit operations in chemical industries (Distillation, evaporation, absorption, liquid-liquid extraction and leaching).

CO 02 Estimate equipment specification and sizing.

CO 03 Practice the use of laboratory scale separators by considering appropriate methodology and safety precautions.

### **BTK3253** **Process Management and Economics**

#### Synopsis

This course deals with cost analysis in engineering decision-making, the management aspects and control of complex projects. Engineering economics topics include cost estimation, time value of money, interest formulas and equivalence calculations, measures of investment worth, depreciation and income tax analysis. Engineering project management topics include knowledge on roles and responsibilities, planning, organization, time, cost, risk and quality management.

#### Course Outcomes

CO 01 Assess the need of chemical engineering graduates when they have to make financial decisions as a team member or project manager.

CO 02 Evaluate theoretical and conceptual basis on which the practice of engineering economics project analysis is built.

CO 03 Apply basic project management concepts and principles through case study.

CO 04 Analyze the economic feasibility of a chemical plant, carried out by examining the capital cost and the manufacturing cost obtained from the cost estimation techniques.

### **BTK3223 Plant Utilities**

#### Synopsis

A typical chemical plant requires adequate utilities to support a successful operation, such as water, steam, fuel, compressed air, HVAC and fire fighting system. The important units operated to supply utilities include treatment systems, steam boilers, piping networks and generator. Students will learn the importance, function and mechanism of the utilities in the plant. In this course also the student will be carried out the laboratory. The amount of utilities is estimated based on the process condition setting and support required in the plant. This course will additionally offer the practical training to operate and troubleshoot the unit operations that supply the utilities.

#### Course Outcomes

- CO 01 Describe the importance, function and mechanism involved in plant utilities systems.
- CO 02 Estimate the plant utilities required to facilitate the operations of the plant.
- CO 03 Display ability to troubleshoot equipment failure related to the utilities system.
- CO 04 Display ethical competent and engineering ethics philosophy

### **BTK3254 Environmental & Sustainable Technology**

#### Synopsis

This subject is designed to introduce to the students the principle of environmental technology and current environmental problems. Topics include water pollution, wastewater quality management, wastewater treatment, air, solid waste treatment and management. The techniques covered involve environmental samples testing, and an

ability to critically evaluate data from a sampling program. The student will learn how to develop an activity using various strategies to control, reduce and monitor all environmental problems.

#### Course Outcomes

- CO 01 Identify the effect of pollutants on the environment (atmosphere, water and soil).
- CO 02 Demonstrate analysis of the quality parameter of wastewater sample, solid waste sample and measure air particulate matter.
- CO 03 Value the outcome of environmental project and emphasized on methods in management/treatment of water, air, solid and hazardous waste.
- CO 04 Verify a sustainable technology solution to protect the environment and fulfil human need for wastewater, solid waste or air pollution issues.

### **BTK3263 Separation Process II**

#### Synopsis

This course aims to introduce the principles of typical unit operations involved in chemical industries which are drying, adsorption, membrane separation process, crystallization and mechanical-physical separation. Students will be exposed to procedures, general problem solving and applications related to the unit operations stated. Laboratory work will be performed involving selected processes where students will be given the experiment objectives to conduct the experiments in group basis. At the end of this course, it is expected that the students will understand the theories, principles, calculations and basic operating parameters associated with every unit operation.

#### Course Outcomes

- CO 01 Analyze basic operation parameters associated with drying, adsorption, membrane separation process, crystallization and mechanical-physical

separation.

CO 02 Assemble the concept and solve problems related to drying, adsorption, membrane separation process, crystallization and mechanical-physical separation.

CO 03 Demonstrate the appropriate skills to operate the equipment related to drying, adsorption, membrane and crystallizer considering the safety and environment precautions.

### **BTK3274**

#### **Process Instrumentation and Control**

##### Synopsis

Process Instrumentation and Control (PI&C) is the branch of engineering that deals with measurement and control. This course provides students with theoretical and practical training in measurement and control of process variables. Topics covered in this subject are introduction to process control, P&ID drawing, process control instrumentations and data transmission and representation..

##### Course Outcomes

CO 01 Assess process control systems and justify the selection of different types of field instrumentations and their applications in process industries.

CO 02 Practice measurement of process variables using different types of field instrumentations.

CO 03 Construct a complete P&ID including alarm system for a particular process or equipment.

CO 04 Value team working and commitment behaviour

### **BTK3714**

#### **Final Year Project I**

##### Synopsis

This course is designed to expose the students to a research/development project. They have to apply all the knowledge they have learned in the

program to complete the research project. Students will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor) in group. During the project I, the students will be able to do a literature survey and prepare a draft which contains objective of the project, problem statement, literature survey, solving techniques, methodology, preliminary results, treatment of results and list of reference publications. At the end of this subject, the students are required to present the draft in a short seminar which will be evaluated by a faculty's panel.

##### Course Outcomes

CO 01 Propose the project proposal on a chosen/given topic in the relevant area.

CO 02 Defend project proposal in formal oral presentation identifying key outcomes and conclusions.

CO 03 Function effectively as a member or leader in the diversified technical teams.

CO 04 Demonstrate a professional ethics and responsibilities towards the project.

CO 05 Propose financial and costing analysis.

CO 06 Revise relevant information independently and practice curiosity in exploring new information

### **BTK4214**

#### **Plant Automation**

##### Synopsis

This subject is designed as an introduction to process automation. Topics that will be covered in this subject include introduction to automation system; development of empirical dynamic process model; feedback process control; controller design and tuning; the application of programmable logic controller (PLC), Supervisory control and data acquisition (SCADA) and distributed control system (DCS) in process automation.

##### Course Outcomes

CO 01 Construct empirical dynamics process model and describe the dynamics

behaviour.

CO 02 Evaluate feedback process control, PID design and tuning.

CO 03 Construct process control and PID tuning using PLC and simulated process control.

### **BTK4726** **Final Year Project II**

#### Synopsis

This subject is the continuation of the subject Final Year Project I. In this subject, the students are required to collect and analyze data, propose solution, model the project, analyzing, conduct research, discussion and write the findings and conclusions. At the end of this semester, the students are required to produce a research project report and present it to faculty's evaluation panel.

#### Course Outcomes

CO 01 Analyze the research problem and construct the solution based on the knowledge of mathematics, sciences and engineering technology fundamentals.

CO 02 Construct project according to the proposed research plan, schedule and estimated cost and solve the problems by using appropriate tools.

CO 03 Evaluate the findings within the scopes and objectives and write the technical paper based on the findings.

CO 04 Defend the research outcomes of project in a formal oral presentation.

CO 05 Demonstrate a professional ethics and responsibilities towards the project.

CO 06 Practice in life-long learning enhancing individual's soft skill through research activities.

CO 07 Practice effectively as a member or leader in the diversified technical teams.

CO 08 Manage project in multidisciplinary environments based on safety regulations

### **BTK4224** **Plant Troubleshooting and Maintenance**

#### Synopsis

The aim of this course is to expose students with maintenance of industrial process plant. Student also will be exposed to the concept of process plant maintenance, standard operating procedures when carrying out maintenance and troubleshooting work. In addition, the mini project and case studies will have industrial involvement for students' exposure.

#### Course Outcomes

CO 01 Explain the concept of process plant maintenance and its strategies.

CO 02 Construct the reliable processing plant through various strategies to ensure smooth plant operations.

CO 03 Improve the operations of major process equipments and its common operating problems

### **BTK4912** **Industrial Training**

#### Synopsis

In Industrial Training the students should gain insight into industrial practice, in order to visualize the tasks and possibilities of their later occupation work. All students are required to undergo an industrial training for a certain period that has been agreed by the faculty during last semester of the fourth academic year. The performance of each student during the periods of his/her industrial training is evaluated by the faculty staff, and the representatives from employer organization.

#### Course Outcomes

CO 01 Develop effort to apply acquired technical skill for problem solving in the industry.

CO 02 Demonstrate a professional commitment and responsibilities at workplace.

CO 03 Evaluate the outcomes of industrial training in a formal oral presentation.

CO 04 Conduct an analysis is on one main issue discovered during

industrial training.

**BTK3813**  
**Petroleum Refining & Petrochemical Technology (E)**

Synopsis

This course exposes the student to the refining and petrochemical industry. Besides, the student will also be able to identify and select the suitable equipment based upon specific conditions and operation in the refinery plant. After understanding the process and standard operating conditions, they will be able to draw a refinery and petrochemical process plant by using software or simulators such as ASPEN Plus, AutoCAD or Microsoft Visio.

Course Outcomes

- CO 01 Identify refinery and petrochemical industry activities
- CO 02 Explain the process operation of refinery and petrochemical plant
- CO 03 Relate the implementation sustainable concept in the refinery and petrochemical industry
- CO 04 Identify issues related to the refinery and petrochemical industry

**BTK3823**  
**Bioprocess Technology (E)**

Synopsis

This subject introduces the basic concepts of bioreactor operational mode for the bioprocessing industry, emphasizing on the application of transport phenomena in bioreactor, scale up, monitoring and control of bioreactor. The topics include introduction of the unit operations that are commonly employed to separate biological products. An idealized process of bioseparation consists of four phases which are the removal of insoluble products, the isolation of desired biological products or concentration, the purification and lastly, polishing of biological products.

The basic methods that will be covered in this course include filtration, centrifugation, cell disruption, precipitation, extraction, adsorption, and chromatography. In addition, an overview on the complete train of bioseparation will also be introduced.

Course Outcomes

- CO 01 Identify different bioreactor operational modes for bioprocessing industry
- CO 02 Explain the principles of the four phases involved in bioseparation
- CO 03 Relate the implementation of sustainable concept to synthesize bioproduct compounds
- CO 04 Identify issues related to the bioprocessing industry

**BTK3843**  
**Food Engineering Technology (E)**

Synopsis

This course is designed to introduce the applications of certain unit operations in the processing of different types of food products. The principles and methods of dehydration, refrigeration and freezing, are discussed with emphasis on their applications in the processing of food products. The course will also provide an appreciation on the importance of food packaging, food safety and hygiene. Students will also be taught to identify the current problem in the food industry. Plant site visit and case studies in food industries also will be done by students for exposure.

Course Outcomes

- CO 01 Identify current status and future trends of food processing industry in Malaysia
- CO 02 Explain the principles of dehydration, refrigeration and freezing in food products
- CO 03 Relate the implementation sustainable concept in food processing industry
- CO 04 Identify issues related to food production technology

### **BTK3863 Oleo Chemical Technology (E)**

#### Synopsis

This course introduces the oleochemical industry operation. It covers some introduction to oils and fats compositions, vegetable oil/plant mill operations, plant oil refinery process, production of edible products, fatty acid and soap production, as well as biofuel derived from vegetable oil and fats. Various fats and oil analyses will be discussed. Various other oleochemical reactions, process sustainability, environment impact and waste management will be discussed based on specific applications.

#### Course Outcomes

CO 01 Identify important activities in oleochemical processing industry  
 CO 02 Explain the process operation in the oleochemical industry.  
 CO 03 Relate the implementation of sustainable concept in the oleochemical processing industry  
 CO 04 Identify issues related to the oleochemical industry

### **BTK3873 Operation Management (E)**

#### Synopsis

This course introduces the operation management. It covers some introduction to competitiveness, strategy & productivity, forecasting, product and service design, strategic capacity planning for product and services, process selection and facility layout, work design and measurement, location planning and analysis, management of quality, quality control, MRP and ERP, inventory management, JIT and lean management, supply chain management, scheduling and project management.

#### Course Outcomes

CO 01 Identify the operation management concept and its importance  
 CO 02 Explain operation management concepts applied in chemical process industries  
 CO 03 Relate the implementation of operation management for a sustainable process  
 CO 04 Identify issues related to the implementation of operation management in the industry

### **MKK7313 Chemical Product Design and Management (E)**

#### Synopsis

This course introduces the chemical product design and management. It includes the extension of chemical engineering design to encompass both process design and product design. The design approach is based on the four-step procedure for chemical product design such as needs, ideas, selection, manufacturing, process improvement and optimization. The waste management from chemical production is also briefly presented. Several case studies in the chemical product design are presented.

#### Course Outcomes

CO1 Develop a sample based on chemical product design approach  
 CO2 Recognize the phases of the chemical product design and differences from industrial process chemistry  
 CO3 Identify the varieties of chemical products in the chemical product design (micro structured products and specialty chemicals)

### **MKK7183 Managing Business Intelligence (E)**

#### Synopsis

This course intends to provide strategies in

managing business and making intelligence decision. It focuses on global sourcing of professional services which covers topics include business process management and outsourcing, business negotiation strategies, business law and ethical and organizational trusts. Students will be exposed to various case studies, locally and internationally.

#### Course Outcomes

CO1 Evaluate the strategies of managing business intelligence decision in sustaining productive industrial operability and quality management.

CO2 Develop business process management plan.

CO3 Consult a business negotiation effectively.

### **MKK7173**

#### **Finance for Entrepreneurship Decision (E)**

#### Synopsis

This course is designed to examine management accounting and related analytical methodologies for decision making and control in profit-directed organizations, to frame accounting and financial issues, including the broader environment in which an enterprise operates. The purpose of this course is to advance student understanding of how to use financial information to value and analyse, and further aiding for entrepreneurship decision. Key topics in managerial accounting are addressed next. Other topics include Corporate risk management and due diligence, and determinants of cost structure will be highlighted.

#### Course Outcomes

CO1 Evaluate financial statements for entrepreneurship decision.

CO2 Construct leveraging portfolio for corporate risk assessment.

CO3 Authenticate principles and ethical values in investment decision.

### **MKK7163**

#### **Catalytic Reaction Engineering (E)**

#### Synopsis

The course focuses on heterogeneous catalysts and reactor design. It provides important background on heterogeneous catalysts and encompasses the catalyst design, characterization methods and qualitative and quantitative nature of catalyst deactivation. Approaches for modeling the kinetics of heterogeneous catalytic reactions are covered. The latter part of the course focuses on multiphase reactor design and operation and the interaction of reactions and transport limitations. Particular attentions are given to catalytic reactors with fixed and fluidized solid phases.

#### Course Outcomes

CO1 Design catalysts and catalytic reactors based on reaction mechanisms

CO2 Construct the engineering models for transport in multiphase reactors by using rigorous models

CO3 Develop reactor design approach for existing processes

### **MPP7143**

#### **Logistics and Operation Management (E)**

#### Synopsis

This course aims to explore the key issues involved with the design and management of supply chains specifically focusing on supply chains in industrial and operation organizations. Both conceptual topics and quantitative tools are presented in the course.

#### Course Outcomes

CLO1 Create value through operations and supply chains.

CLO2 Plan and control operations and supply chains.



CLO3 Design the operations environment and supply chain linkages.

**MPP7113**  
**Project Management (E)**

Synopsis

The aim of the course is to design project management concept in chemical engineering process and industry.

Course Outcomes

CLO1 Articulate the core concepts of project management.

CLO2 Analyze various activities and processes involved in managing an active project.

CLO3 Evaluate project management activities using appropriate tools and methods.

## CURRICULUM STRUCTURE BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (PHARMACEUTICAL) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
COURSES	BUM1223 Calculus	BUM2113 Applied Mathematics	BUM2413 Applied Statistics	UHL2432 English for Professional Communication	UHC2022 Penghayatan Etika dan Peradaban	UHF21*1 Foreign Language 2	UGE2002 Technopreneurship	BTF4912 Industrial Training
	UQ*1**1 Co-Curriculum 1	UHL2412 English for Academic Communication	UHL2422 English for Technical Communication	UQ*2**1 Co-Curriculum 2	UHF11*1 Foreign Language 1	BTF4673 Final Year Project 1	BTF4675 Final Year Project 2	
	UHC1012 Falsafah dan Isu Semasa	BTF2232 Contamination Control & Clean Room	UHS1022 Soft Skills	BTF2723 Industrial Networks	BTF3243 Bioprocessing Technology	BTF3643 Regulatory Affairs	BTF4693 Pharmaceutical Product Lifecycle and Safety	
	BTF1113 Organic Chemistry	BTF1613 Introduction to Pharmaceuticals	BTF2632 Introduction to GMP	BTF1623 Manufacturing & Processing Technology	BTF3163 Pharmaceutical Manufacturing Process Development	BTF3363 Manufacturing Systems Lean Six Sigma	BTF3652 Contemporary Trends in Industry	
	BTF1712 Computer Programming for Engineers	BTF1523 Electrical Fundamentals	BTF1133 Pharmaceutical Separation Technology	BTF1143 Pharmaceutical Waste Management	BTF38*3 Elective 1	BTF38*3 Elective 2	BTF38*3 Elective 3	
	BTF1312 Material and Process	BTF2333 Thermodynamic	BTF2323 Fluid Mechanics	BTF2153 Pharmaceutical Formulation Methods	BTF4253 Analytical Techniques for Pharmaceutical Industry	BTF3373 Quality Management System	BTF4663 System Validation	
	BTF1513 Engineering Science	BTF2223 Cell Biology	BTF2263 Upstream Biopharmaceutical Processing	BTF2543 Process Control and Instrumentation	BTF4682 Drug Delivery System	BTF3353 Automation Systems		
			BTF2412 Numerical Methods & Optimization		BTF4752 Research Methodology			
TOTAL CREDIT PER SEMESTER	19	19	20	18	19	19	18	12
OVERALL TOTAL CREDIT FOR GRADUATION	144							

**ELECTIVE COURSES FOR  
BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (PHARMACEUTICAL)  
WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BTF3813	Advanced Drug Delivery Systems	3
2	BTF3823	Materials Processes & Colloid Science	3
3	BTF3833	OSH in Pharma Industry	3
4	BTF3843	Utilities Requirement for Pharmaceutical Industry	3
5	BTF3853	Natural Product Development	3
6	BTF3863	Natural Product Commercialization	3
7	BTF3873	Pharmacology	3
8	BTF3883	Biopharmaceutics	3
9	MKK1163	Catalytic Reaction Engineering	3
10	MKK1173	Finance for Entrepreneurship Decision	3
11	MKK1183	Managing Business Intelligence	3
12	MKK1313	Chemical Product Design and Management	3
Total minimum credits of elective courses for graduation			9

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	To produce pharmaceutical technologists with advance standing of the needed knowledge and expertise to serve industrial needs.
PEO2	To produce pharmaceutical technologists with technical skills of acquiring knowledge in pursuit of lifelong learning for industry development.
PEO3	To produce pharmaceutical technologists with excellent soft-skill and professional ethics that suit local and global society

**PROGRAMME OUTCOMES (PO)**

PO1	<b>Engineering Knowledge</b> Apply knowledge of mathematics, science, engineering fundamentals and engineering technology principles to define and apply engineering technology procedures, processes, systems or methodologies in pharmaceutical technology area
PO2	<b>Problem Analysis</b> Ability to solve broadly-defined pharmaceutical engineering technology problems systematically to reach substantiated conclusions by using appropriate tools and techniques.

PO3	<p><b>Design of Solutions</b> Ability to design solutions for broadly-defined pharmaceutical engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.</p>
PO4	<p><b>Investigation</b> Ability to plan and conduct experimental investigations of broadly-defined pharmaceutical engineering technology problems by using data from relevant sources.</p>
PO5	<p><b>Modern Tool Usage</b> Ability to select and apply appropriate techniques, resources and modern pharmaceutical engineering technology tools, with an understanding of their limitations.</p>
PO6	<p><b>Individual &amp; Team Work</b> Ability to function effectively as individuals, and as members or leaders in diverse technical teams.</p>
PO7	<p><b>Communication</b> Ability to communicate effectively with the pharmaceutical engineering technology community and society at large.</p>
PO8	<p><b>Engineering &amp; Society</b> Ability to demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.</p>
PO9	<p><b>Ethics</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.</p>
PO10	<p><b>Project Management &amp; Finance</b> Ability to demonstrate an awareness of management, business practices and entrepreneurship in the field of pharmaceutical engineering technology.</p>
PO11	<p><b>Environment &amp; Sustainability</b> Ability to demonstrate an understanding of the impact of pharmaceutical engineering technology practices, taking into account the need for sustainable development.</p>
PO12	<p><b>Life-long Learning</b> Ability to recognize the need for professional development and to engage in independent and lifelong learning in the field of pharmaceutical engineering technology.</p>

**COURSE SYNOPSIS****BACHELOR OF MANUFACTURING  
ENGINEERING TECHNOLOGY  
(PHARMACEUTICAL) WITH HONOURS****BTF1113 Organic Chemistry;****Credit Hour: 3****Prerequisite : None**

## Synopsis

This course discusses the fundamental theory of the properties, synthesis and organic reactions where use the functional group as framework as a basic level courses with an organic chemical content. It is also focuses on the key concepts of organic chemistry through a study of the reactions of selected nonfunctional and functional groups. Emphasis is placed on the underlying mechanistic pathways that are involved and the stereochemistry of the molecular structure is also considered.

Course Outcome

By the end of semester, students should be able to:

CO1: Explain the common organics structures, properties, synthesis and reactions of aliphatic hydrocarbons and alcohol groups

CO2: Demonstrate the properties, chemicals reactions and steps of mechanism for the synthesis of aromatic hydrocarbons, carbonyl groups and amine

CO3: Construct the synthesis of organic compounds and identification of their functional groups

CO4: Present the compounds that have been synthesise and their applications in team

**BTF1213 Microbiology;****Credit Hour: 3****Prerequisite: None**

## Synopsis

This course aims to provide the students with knowledge of the structure of prokaryotic and eukaryotic cells and biomolecules they are made from. The basic principle of microbiology, including organisms, growth and their industrial application.

## Course Outcome

By the end of semester, students should be able to:

CO1: Compare the basic structures of prokaryotic and eukaryotic cells, the key components and their functions.

CO2: Explain the application of the cell and its operation in industrial biotechnology

CO3: Explain the basis for disinfection and sterilization processes and their applications in bio/pharmaceutical manufacturing.

CO4: Perform and report results of simple laboratory techniques related to aseptic technique, microbial isolation and identification, and simple microscopy technique.

**BTF1712 Computer Programming for Engineers;****Credit Hour: 2****Prerequisite: None**

## Synopsis

This subject aims to introduce the fundamental element and feasibilities of the computer programming by using MATLAB mathematical computing program. Students will be taught on analyzing data, developing a program using m-file and using the command window. They will learn to solve general engineering mathematical equations in MATLAB, displaying the data via 2D and 3D graphs and to learn to develop the graphical user interface (GUI) for program.

## Course Outcome

By the end of semester, students should be able to:

- CO1: Organize and analyse the data by using MATLAB
- CO2: Understand and develop the program to solve the mathematical problems
- CO3: Apply software to solve engineering and mathematical problems
- CO4: Demonstrate the ability to transform the problem to design and from design to an operational program

**BTF1312 Material & Process;**  
**Credit Hour: 2**  
**Prerequisite: None**

Synopsis

This course provides the student with fundamental knowledge in materials and processes for both metals and polymers. It will provide students with an overview of the relationship between the structure and properties of materials and their influences on manufacturing processes. It will provide the student with the knowledge required to implement both manufacturing process selection through the analysis of design requirements. The student will expand their knowledge of the environmental aspects of materials which is polymer degradation and corrosion of materials as well as the selection of materials.

Course Outcome

By the end of semester, students should be able to:

- CO1: Explain the elementary relationships between structure, properties and performance of materials that are essential for understanding the role of materials in the design of engineering systems.
- CO2: Discuss the fundamentals structure, processing and properties of polymeric materials and metals
- CO3: Demonstrate the effects of different tests on materials

**BTF1513 Engineering Science;**  
**Credit Hour: 3**  
**Prerequisite: None**

Synopsis

This subject is an introduction to the basic principles of physics and it explores concepts in the areas of mechanics, properties of matter, heat, waves, sound, light and atomic physics which are relevant for engineering students.

Course Outcome

By the end of semester, students should be able to:

- CO1: Identify and describe fundamentals in engineering sciences
- CO2: Apply the concept of engineering sciences to overcome engineering problems
- CO3: Conduct experiments and interpret the results materials in the design of engineering systems.

**BTF2232 Contamination Control and Clean Room;**  
**Credit Hour: 2**  
**Prerequisite: None**

Synopsis

This module aims to provide the student with in-depth knowledge to understand and work clean room environment with clear concepts in contamination control

Course Outcome

By the end of semester, students should be able to:

- CO1: Illustrate the basic concepts of clean room and contamination control.
- CO2: Outline mechanisms, problems, equipment and practices related to clean

room.

CO3: Outline mechanisms, problems, equipment and practices related to contamination control.

CO4: Defend with presentation in matters related to contamination control and cleanroom concepts.

### **BTF1613 Introduction to Pharmaceutics;**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This module aims to provide the student with an understanding of the basics in pharmaceutical dosage form, pharmaceutical packaging, the mode of action and the evaluation of the dosage form.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Differentiate between different classes of pharmaceutical products

CO2: Explain the type of packaging, closure systems labels used in pharmaceutical manufacturing environment

CO3: Demonstrate the evaluation and unit operations of product development involved in the manufacture of a drug formulations

CO4: Commit a good communication skills through presentation and report writing

### **BTF1523 Electric Fundamentals;**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

Familiarize students with the principles of energy storage and transport in electric and magnetic circuits. The course will provide

the knowledge and skills required to safely build electric circuits and to measure and analyze the currents, voltage and power in circuit.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the basic concept of electricity, conductors, insulators, circuits and magnetism

CO2: Apply circuit analysis theorems in DC and AC circuits by using Ohm and Kirchhoff Laws

CO3: Produce simple electric circuits. Use lab equipment to measure voltage, current and resistance/impedance safely.

CO4: Work in a team and communicate effectively.

### **BTF2333 Thermodynamic;**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This subject is designed to introduce the basic concept in thermodynamics. Topics that will be covered in this subject include the properties of pure substances, thermodynamics system, the First Law of Thermodynamics for closed systems, open systems and their application in steady-flow and unsteady-flow processes, The Second Law of Thermodynamics, entropy, introduction to refrigeration, heat engine, and heat pump.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Discover the state of properties from property diagram and obtaining data from property table.

CO2: Solve energy balance for both closed

and open system using the First Law of Thermodynamics.

CO3: Analyze cyclic devices (heat engine, heat pump and refrigerator), steady flow devices and isentropic processes using the Second Law of Thermodynamics.

CO4: Demonstrate the relationship between thermodynamics behavior and properties via experimental work and laboratory report.

### **BTF2223 Cell Biology ;**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This course aims to provide the students with the theoretical and practical fundamentals of the structure and function of the cell, the essential principles, and processes in cell biology and integrates these in the context of molecular biology. The course focuses on providing understanding of the cell as the basic biological unit. The course is divided into 4 parts namely: chemical and molecular foundations, molecular genetic mechanisms, cell structure and function, and cell growth and development.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Identify the fundamental components of cells and explain their roles inside the cell and function and describe the techniques to determine the protein's structure
- CO2: Describe the mechanisms and processes involved in the different biological system
- CO3: Discuss recombinant cell technology in pharmaceutical industry

### **BTF2632 Introduction to GMP;**

**Credit Hour: 2**

**Prerequisite: None**

#### Synopsis

This course aims to provide the students with in-depth understanding of Good Manufacturing Practices with quality assurance in a pharmaceutical manufacturing industry. The course provides an understanding about quality control, quality assurance, validations, complaints, training and documentation in the pharmaceutical manufacturing industry.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain the necessity and basics of GMP in pharmaceutical industry
- CO2: Analyze the standard of GMP plant by considering quality control, quality assurance, validation and documentation
- CO3: Demonstrate concern to the impact of Good Manufacturing Practice towards the issues in Pharmaceutical industry
- CO4: Defend ideas with appropriate evidence from Pharmaceutical Inspection Co-operation Scheme (PICS) standards to maintain GMP standards in Pharmaceutical industry

### **BTF1133 Pharmaceutical Separation Technology;**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This course emphasizes on the several mechanisms involved in chemical processes. It signifies different applications of liquid- liquid, vapour- liquid and solid-liquid separation process which consists of



various unit operations that are commonly used in industry

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply the knowledge of mass balance and mass transfer in separation process
- CO2: Solve problems related to separation process by applying the formula relevant to specific unit operations
- CO3: Perform experiment that related to unit operations in pharmaceutical process
- CO4: Commit as a dynamic team player and gives adequate support to the team

#### **BTF2323 Fluid Mechanics;**

**Credit Hour: 3**

**Prerequisite: BTF1513 Engineering Science**

#### Synopsis

This module will introduce students to the principles of fluid mechanics. Students will apply these principles to the solution of engineering problems such as pipe sizing and the selection of system components such as valves and pumps. The module goal is to enable the student to develop the knowledge and analytical skills in solving practical problems of fluid mechanics, through applications to system design and performance studies.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply the fluid principles, Bernoulli's equation, continuity equation, fluid properties and various applications
- CO2: Analyse the fluid systems in real pipeline systems and fluid machines.

CO3: Determine the parameters of fluid experiments

#### **BTF2263 Upstream Biopharmaceutical Processing;**

**Credit Hour: 3**

**Prerequisite: BTF2223 Cell Biology**

#### Synopsis

This course aims to provide the students with the theoretical and practical fundamentals of the Upstream bioprocessing technology in the pharmaceutical industry. The course focuses on providing understanding of types of bioreactors and parameters to control during the scale-up process for both animal cells and microbes.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Describe the pharmaceutical products derived from animal cell technology, key parameters involve in scale-up process and types of sterilization process involved during fermentation activity
- CO2: Apply the knowledge of bioreactor instrumentation and control in the scale up operations to produce pharmaceutical product in large scale
- CO3: Distinguish the types of bioreactors and mode of operations according to the type of cells used to produce biopharmaceutical products
- CO4: Perform basic cell culture and fermentation techniques with regard to bioreactor/fermenter operation and analyses the growth parameters and product concentrations
- CO5: Express with documentation in matters related to biotechnology techniques & applications

**BTF2412 Numerical Methods & Optimization;****Credit Hour: 2****Prerequisite: BUM2113 Applied Mathematics, BTF1712 Computer Programming for Engineers****Synopsis**

This subject teaches the techniques by which mathematical problems are formulated so that they can be solved with arithmetic operations. Topics covered in this subject are roots of equation, systems of linear algebraic equations, optimisation, curve fitting, numerical differentiation & integration, ordinary differential equation and partial differential equation. Some software packages are introduced to empower the students in problem solving.

**Course Outcome**

By the end of semester, students should be able to:

CO1:Optimise a process employing numerical methods.

CO2:Apply numerical methods as a problem-solving tool.

CO3:Solve optimisation & numerical methods problem by using software packages.

**BTF2723 Industrial Networks;****Credit Hour: 3****Prerequisite: None****Synopsis**

This course aims to equip the student with the skills necessary to understand various network topologies and protocols which are encountered in the industrial environment. The students are also familiarized with hardware elements of a typical network system such as cabling, nodes, sensors, network devices and interfaces.

**Course Outcome**

By the end of semester, students should be able to:

CO1:Explain the basic of computer networking

CO2:Execute a simple LAN topologies by applying basic principles of cabling using network simulation

CO3:Apply basic configuration of network design using real network devices such as switches and routers

CO4:Formulate standard configuration and troubleshooting network using professional technique

**BTF1623 Manufacturing & Processing Technology;****Credit Hour: 3****Prerequisite: BTF1613 Introduction to Pharmaceutics****Synopsis**

This course is designed to provide the student with an understanding of the equipment unit processes used in the pharmaceutical industry and the organization of pharmaceutical manufacturing plants.

**Course Outcome**

By the end of semester, students should be able to:

CO1:Analyze major criteria in the manufacturing of pharmaceutical products including drug development, scale-up process and plant organization, management & utilities

CO2:Analyze the processes involved in drug synthesis, its recovery, formulation and filling

CO3:Demonstrate the sequence of steps in formulation & filling, product recovery and plant utilities operation.

CO4:Defend theories and prioritize time

effectively to meet the needs of organization

**BTF1143 Pharmaceutical Waste Management;**  
**Credit Hour: 3**  
**Prerequisite: None**

#### Synopsis

The course aims to provide students with the basic knowledge of pharmaceuticals in the environment and presents the fundamental concepts and techniques in waste analysis. This course focuses on the types of pharmaceutical wastes, their sources and life cycle in the environment as well as their effects on human and animal health. Students are also exposed to proper pharmaceutical waste disposal techniques and green and sustainable pharmaceutical practices.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain different types of pharmaceuticals, pharmaceutical wastes and their point of sources
- CO2: Describe the effects of pharmaceutical wastes on human and animal health
- CO3: Analyze environmental risks of pharmaceuticals
- CO4: Perform basic water and wastewater evaluation and analytical techniques
- CO5: Demonstrate the role of individual within the team in the completion of tasks

**BTF2153 Pharmaceutical Formulation Methods;**  
**Credit Hour: 3**  
**Prerequisite: BTF1613 Introduction to Pharmaceutics**

#### Synopsis

This course aims to provide the student with an in-depth knowledge of formulation development, manufacture and process limitations of solid & liquid dosage forms, sustained release products, veterinary products, aerosols and topical products.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply in detail the formulation aspects of pharmaceutical and veterinary dosage forms.
- CO2: Analyze in detail the instrumentation and manufacturing aspects of pharmaceutical and veterinary dosage forms.
- CO3: Ability to perform formulation development experiments
- CO4: Ability to document and present as individuals in matters related to pharmaceutical formulations: process and limitation

**BTF2543 Process Control and Instrumentation;**  
**Credit Hour: 3**  
**Prerequisite: BTF1523 Electrical Fundamentals**

#### Synopsis

Process Instrumentation and Control (PI&C) is the branch of engineering that deals with measurement and control. This course provides students with theoretical and practical training in measurement and control of process variables. Topics covered in this subject are introduction to process control, P&ID drawing, process control instrumentations and data transmission and representation.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain the basic control system and different types of field instrumentations and its applications in process industries, as well as control systems.
- CO2: Perform measurement of process variables using different types of field instrumentations.
- CO3: Construct a complete P&ID including alarm system for a particular process or equipment.
- CO4: Adapt team working and commitment behaviour.

**BTF3243 Bioseparation Technology;**  
**Credit Hour: 3**  
**Prerequisite: BTF1213 Microbiology**

Synopsis

This course aims to provide the students with the theoretical and practical fundamentals of the technology of bioproduct separation technology. The course focuses on providing understanding of bioseparation processes of four RIPP phases which are recovery, isolation, purification, and polishing

Course Outcome

By the end of semester, students should be able to:

- CO1: Apply the principles of each bioseparation technique to solve any related bioseparation problems
- CO2: Analyze the operation and limitations of the protein separation techniques required for lab scale and industrial processing
- CO3: Perform operational and analytical procedures with regard to bioseparation techniques
- CO4: Develop the experimental method

proposal and a review of literature through project organization and time efficiently

**BTF3163 Pharmaceutical Manufacturing Process Development;**  
**Credit Hour: 3**  
**Prerequisite: BTF1133 Pharmaceutical Separation Technology**

Synopsis

This module aims to provide the student with the theoretical and practical fundamentals of scale up and process development in pharmaceutical manufacturing. The process development starts from Research & Development (R&D) stage to waste disposal control

Course Outcome

By the end of semester, students should be able to:

- CO1: Identify the aspects in R&D process change prior to scale up
- CO2: Apply the knowledge of process development, evaluation and risk management
- CO3: Analyze the changes in process variables for scaled up process
- CO4: Construct a HAZOP study by applying risk management tools

**BTF4253 Analytical Techniques for Pharmaceutical Industry;**  
**Credit Hour: 3**  
**Prerequisite: None**

Synopsis

This module provides the theoretical foundation for analytical techniques used in material characterization, pre-formulation development and Process Analytical Technology (PAT)

applications. Apply the handling operation of selected analytical techniques used in the pharmaceutical industry. Topics included: Spectroscopy, chromatography, particle analysis, thermal analysis, sensors, electron microscopy, microbiological testing, stability testing and metal and mineral trace analysis

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain Process Analytical Techniques (PAT) and the benefits to pharmaceutical industry

CO2: Discuss theory, principles and application of analytical techniques used in material characterization, pre-formulation development, manufacturing process and storage stability

CO3: Perform standard operation on selected analytical techniques and interpret the results obtained from the experiments

CO4: Express with documentation in matters related to analytical instruments and their applications in pharmaceutical industry

CO5: Adopt the impacts of the environment and sustainability to solve engineering problems.

#### **BTF4682 Drug Delivery System;**

**Credit Hour: 2**

**Prerequisite: None**

#### Synopsis

Drug delivery sciences involves the engineered technologies for the targeted delivery and/or controlled release of therapeutic agents.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Analyze the mechanism of drug delivery for different forms of delivery systems like nanoparticles, liquid and solid dosage forms.

CO2: Evaluate the factors influencing the delivery system into the human body and their pharmacokinetic effect like absorption, distribution and release.

CO3: Outline the drug delivery considerations and impacts on the therapeutic outcome.

#### **BTF4752 Research Methodology;**

**Credit Hour: 2**

**Prerequisite: None**

#### Synopsis

This course intended to prepare students to design experiments, analyze data, evaluate results and report findings. Students will be exposed to the technique in selecting appropriate research problems and parameters to identify appropriate research topics.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Analyze the different kind of research design and methodology and apply the appropriate method according to the niche area of research interest

CO2: Develop independent critical thinking for analysing research report/ article

CO3: Generate appropriate research proposal to undertake research project as well as for grant application

CO4: Contribute and complete the given task in timely manner

#### **BTF3643 Regulatory Affairs;**

**Credit Hour: 3****Prerequisite: BTF2632 Introduction to GMP**

## Synopsis

This module aims to provide the student with a detailed understanding of the regulatory framework for the development, documentation, production and approval of pharmaceutical products and post-marketing issues.

## Course Outcome

By the end of semester, students should be able to:

CO1: Describe and interpret the GxP guidelines and the legislation governing the manufacture of pharmaceutical products in Malaysia and ASEAN countries.

CO2: Outline the regulatory, product life cycle including raw material sourcing and validation

CO3: Express with documentation in the regulatory inspection and the significance of post-marketing issues in the pharmaceutical industry.

**BTF4673 Final Year Project I;****Credit Hour: 3****Prerequisite: BTF4752 Research Methodology**

## Synopsis

This course is designed to expose the students to a research/development project. They have to apply all the knowledge that they have learned in the program to complete the project. Each student will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor). During the Final Year Project I, the students should be able to write a project proposal consisting of the

objective of the project, problem statement, literature survey, solving techniques, methodology, and expected result, project scheduling and costing. At the end of this subject, the students are required to present the draft in a short seminar which will be evaluated by a faculty's panel.

## Course Outcome

By the end of semester, students should be able to:

CO1: Propose the project proposal on a chosen/given topic in the relevant area.

CO2: Defend project proposal in a formal oral presentation identifying key outcomes and conclusions.

CO3: Function effectively as a member or leader in the diversified technical teams

CO4: Demonstrate a professional ethics and responsibilities towards the project

CO5: Propose financial and costing analysis

CO6: Classify relevant information independently and demonstrate curiosity in exploring new information

**BTF3363 Manufacturing System Lean Six Sigma;****Credit Hour: 3****Prerequisite: None**

## Synopsis

Introduction to modern issues in lean manufacturing systems and practice of lean tools. Topics include overview of lean manufacturing systems, quick changeover, total productive maintenance, pull/just-in-time/kanban, cellular manufacturing, kaizen, wastes identification, productivity measurement, plant layout, and line balance. At the end of the semester the students should have a basic understanding of the design, operation and control of lean manufacturing systems and be able to use quantitative methods to model, analyze, and optimize such

systems.

#### Course Outcome

By the end of semester, students should be able to:

CO1:Outline the background, philosophy of lean production and identify the seven types of waste in a manufacturing company.

CO2:Arrange the evaluation techniques to measure productivity in lean manufacturing activities.

CO3:Organize and control project implementation

CO4:Demonstrate concern to the impact of practice toward the issues and able to adapt to other related problems

#### **BTF3373 Quality Management System;**

**Credit Hour: 3**

**Prerequisite: BTF2632 Introduction to MP**

#### Synopsis

This course aims to provide the student a comprehensive knowledge and understanding to ensure that finished product are fit for their intended use, comply with the requirements of the marketing authorisation and do not place patients at risk due to inadequate safety, quality or efficacy.

#### Course Outcome

By the end of semester, students should be able to:

CO1:Evaluate the process of translating quality policy into processes, procedures, and instructions to achieve measurable objectives and requirements.

CO2:Generate the planned and methodical activities executed as part of a quality system to provide confidence that

process, product, or service requirements for quality are being satisfied.

CO3:Express the act of monitoring, appraising, and correcting a process, product, or service to ensure requirements for quality are being satisfied.

CO4:Defend the process of analyzing performance and taking methodical, systemic actions to improve it.

#### **BTF3353 Automation Systems;**

**Credit Hour: 3**

**Prerequisite: BTF1523 Electrical Fundamentals**

#### Synopsis

This course provides an overview of automation in the industry. It includes the introduction of automation equipment such as robots and sensors as well as automation mechanisms such as pneumatic and hydraulic systems. In addition, automation applications in pharmaceutical manufacturing is also introduced. Laboratory experience with automated technology is also emphasized.

#### Course Outcome

By the end of semester, students should be able to:

CO1:Understand the production system, the automation principles and related technologies.

CO2:Demonstrate various automation techniques currently used in industry and list components of an assembly process

CO3:Design and implement an automation project for pharmaceuticals manufacturing

**BTF4693 Pharmaceutical Product Lifecycle and Safety;**  
**Credit Hour: 3**  
**Prerequisite: None**

Synopsis

This course provides a comprehensive introduction to pharmaceutical product lifecycle and safety. Students should be able to describe the processes for monitoring the safety of drugs, biologics, medical devices, nutritional or supplements and cosmetics throughout a product's life cycle. Provides an overview of national and global regulations governing the safety of medical products including drugs, diagnostics, medical devices, and biologics. Topics include an overview of the key components of product safety, product safety terminology, the processes for monitoring product safety, and the regulations that govern product safety and pharmacovigilance, a review of the regulatory agencies; regulations for pre-clinical, clinical, and post-market production safety; and regulations governing the process for monitoring product safety.

Course Outcome

By the end of semester, students should be able to:

- CO1: Outline a basic understanding of regulatory processes associated with pre-marketing and post-marketing of product safety and pharmacovigilance.
- CO2: Analyze the processes for monitoring the safety of drugs, biologics, medical devices, nutritional or supplements and cosmetics throughout a product's life cycle.
- CO3: Demonstrate the role of individuals in a team to achieve task completion.

**BTF3652 Contemporary Trends in**

**Pharmaceutical Industry;**  
**Credit Hour: 2**  
**Prerequisite: None**

Synopsis

This module aims to provide the student with in-depth knowledge to understand the pharmaceutical business organization, regulatory parts and recent advanced technological applications.

Course Outcome

By the end of semester, students should be able to:

- CO1: Describe recent regulatory requirements, technical guides and manufacturing technology to pharmaceutical industry
- CO2: Analyze effectiveness of recent trends to pharmaceutical manufacturing
- CO3: Defend with presentation in matters related to interpretation and applications of new regulatory systems
- CO4: Maintain the code of practice in report writing

**BTF4675 Final Year Project II;**  
**Credit Hour: 5**  
**Prerequisite: BTF4673 Final Year Project I**

Synopsis

This subject is the continuation of the subject Final Year Project I. In this subject, the students are required to collect and analyze data, propose solution, model the project, analyzing, conduct research, discussion and write the findings and conclusions. At the end of this semester, the students are required to produce a research project report and present it to faculty's evaluation panel.

Course Outcome



By the end of semester, students should be able to:

- CO1: Analyze the research problem and construct the solution based on the knowledge of mathematics, sciences and engineering technology fundamentals
- CO2: Execute project according to the proposed research plan, schedule and estimated cost and solve the problems by using appropriate tools
- CO3: Discuss the findings within the scopes and objectives and write a technical report based on the findings
- CO4: Defend the research outcomes of project in a formal oral presentation
- CO5: Demonstrate a professional ethics and responsibilities towards the project
- CO6: Engage in life-long learning enhancing individual's soft skill through research activities
- CO7: Function effectively as a member or leader in the diversified technical teams
- CO8: Manage project in multidisciplinary environments based on safety regulations

### **BTF4663 Systems Validation;**

**Credit Hour: 3**

**Prerequisite: BTF2632 Introduction to GMP, BTF1623 Manufacturing & Processing Technology**

#### Synopsis

This module aims to provide students with insights about the processes of validation in the pharmaceutical industry. Students will be familiarized with a concept of documented evidence that provides an assurance that a specific process, method or system will consistently produce to the required specification in accordance with accepted standards of Good Manufacturing Practice (GMP). This will provide the students with a good basis to construct validation protocols and implement them

appropriately at the workplace.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Evaluate the existing facilities, systems, equipment and processes in pharmaceutical industry to be validated
- CO2: Generate validation plans, protocols and reports for validation process
- CO3: Express with documentation in matters related to system validation in pharmaceutical industry

### **BTF4912 Industrial Training;**

**Credit Hour: 12**

**Prerequisite: Must pass all courses.**

#### Synopsis

In Industrial Training the students should gain insight into industrial practice, in order to visualize the tasks and possibilities of their later occupation work. All students are required to undergo industrial training for a certain period that has been agreed by the faculty during the last semester of the academic year. The performance of each student during the periods of his/her industrial training is evaluated by the faculty staff, and the representatives from employer organizations.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Initiate effort to apply acquired technical skill for problem solving in the industry
- CO2: Function as a professional and ethical trainee in an organization during industrial training.
- CO3: Demonstrate professional commitment and responsibilities at the

workplace.

CO4: Present the outcomes of industrial training in a formal oral presentation.

CO5: Conduct an analysis on one main issue discovered during industrial training

**BTF3813 Advanced Drug Delivery Systems (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

**Synopsis**

This course aims to provide the student with an in-depth knowledge of both theoretical and practical in formulation development, characterization and pharmacological applications of advanced drug delivery systems.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Analyze the concepts of advanced drug delivery and its rationale, use of biodegradable polymers, targeted drug delivery and overview of existing marketed formulations with their pharmacological applications.

CO2: Design formulation development aspects of diverse pharmaceutical advanced drug delivery systems.

CO3: Perform formulation development of advanced drug delivery systems

CO4: Defend with documentation in matters related to advanced drug delivery systems: Formulation techniques, characterization & applications

**BTF3823 Material Processes & Colloid Science (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

**Synopsis**

This course aims to introduce students to the information about surface, interface, surfactants, types and mechanism involved in colloids and rheological properties of the colloidal systems to formulate a stable colloidal dosage form such as emulsion, suspension, ointment, cream etc.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Outline the properties of colloids and technical surfaces

CO2: Analyze the rheology and formulation of pharmaceutical colloidal dosage forms

CO3: Design the formulation and evaluation of colloidal systems experiments

CO4: Demonstrate and defend with presentations related to materials processes and colloidal science.

**BTF3833 Safety & Health in Pharmaceutical Industry (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

**Synopsis**

This course is intended to provide students with fundamental knowledge of safety and health in industry, particularly in pharmaceutical industry, as well as the law and regulation that one industry should comply with in order to ensure a safe workplace environment. Students will also be taught on hazards identification and the assessment of it through proper safety management.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Integrate the fundamental of safety & health and its practices to pharmaceutical industry

CO2: Design health and safety programs to control and minimize occupational hazards using project management principles and processes

CO3: Demonstrate the ability to use the software to analyze and solve safety & health-related problem

CO4: Contribute and complete the given task in the given timeframe

### **BTF3843 Utilities Requirement for Pharmaceutical Industry (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This module aims to provide the student with the theoretical and practical fundamentals of water technology and Heating, Ventilation and Air Conditioning (HVAC) System. The chapters cover pharmaceutical water characteristics and quality. For the engineering section, the students will learn about unit operations involved in producing pharmaceutical grade water. This module also covers the theoretical, application and operation of HVAC systems.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Analyse the biological and chemical impurities in pharmaceutical water

CO2: Analyse the main components and their purposes of water treatment and HVAC operations

CO3: Conceptualize the current status of equipment in pharmaceutical water generation and HVAC system for periodical maintenance

CO4: Operate the water system in producing purified water and HVAC system maintenance checking in generating high quality air for cleanroom purpose

### **BTF3853 Natural Product Development (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This course highlights the steps and processes one should undergo in order to develop a natural product. Students will be introduced to the processes that begin from authentication, extraction, formulation and registration of products.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Compare the chemical and analytical processes in establishing a prominent lead compound involved during the development of natural products.

CO2: Analyze the different types of analytical and experimental tests to be performed for natural product registration by the local Drug Authority.

CO3: Conceptualize the final dosage of natural products and its pharmacological effects on drug targets.

CO4: Develop a natural product from a crude extract into any dosage forms by using appropriate techniques and methods

### **BTF3863 Natural Product Commercialization (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

### Synopsis

This course describes the process required to commercialize nutraceutical products. Students will be introduced to processes that start from large-scale production, market research, intellectual property registration, commercialization path and feasibility analysis.

### Course Outcome

By the end of semester, students should be able to:

CO1:Determine the characteristics of the corresponding products that are marketable and challenging in marketing the product.

CO2:Analyze a set of commercially valuable rights and route of commercialization

CO3:Develop the process of bringing research products to market.

CO4:Develop the product prototypes that are appropriate and meet market expectations.

### **BTF3873 Pharmacology (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

### Synopsis

This course aims to provide students with a comprehensive knowledge of fundamental Pharmacology, drug absorption, distribution, metabolism and excretion. Expose students with knowledge of mechanism of action and uses of the major classes of clinically important drugs currently used in medical practice. These include drugs affecting the autonomic nervous system; anesthetics and analgesics; drugs to treat the heart and diseases of the cardiovascular system;

drugs that affect the immune system; drugs that affect the endocrine system etc.

### Course Outcome

By the end of semester, students should be able to:

CO1:Analyze the principles of pharmacokinetics that underlie the absorption, distribution, metabolism and elimination of drugs in the body.

CO2:Evaluate the scientific basis of drug-drug interactions within the body and the undesirable effects.

CO3:Outline the Pharmacology and the mechanism of action of the major class of clinically important drugs.

CO4:Express with documentation in matters related to clinical use and mechanism of actions of selected drugs.

### **BTF3883 Biopharmaceutics (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

### Synopsis

This course aims to provide the students with in-depth understanding and applying the biopharmaceutics principles absorption, distribution, metabolism, excretion, bioavailability and pharmacokinetics to expand knowledge of drug action and the influence of physiological and chemical function of drug disposition.

### Course Outcome

By the end of semester, students should be able to:

CO1:Compare the different routes of drug administration

CO2:Analyze the principles of pharmacokinetics that underlie the absorption, distribution, metabolism and elimination of drugs in the body.

CO3: Evaluate the effects of physiological factors and variability of pharmacokinetics parameters towards drug disposition within body.

CO4: Express ideas related to biopharmaceutics and pharmacokinetics.

**MKK1163 Catalytic Reaction Engineering (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

**Synopsis**

The course focuses on heterogeneous catalysts and reactor design. It provides important background on heterogeneous catalysts and encompasses the catalyst design, characterization methods and qualitative and quantitative nature of catalyst deactivation. Approaches for modeling the kinetics of heterogeneous catalytic reactions are covered. The latter part of the course focuses on multiphase reactor design and operation and the interaction of reactions and transport limitations. Particular attentions are given to catalytic reactors with fixed and fluidized solid phases.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Design catalysts and catalytic reactors based on reaction mechanisms

CO2: Construct the engineering models for transport in multiphase reactors by using rigorous models

CO3: Develop reactor design approach for existing processes

**MKK1173 Finance for Entrepreneurship Decision (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

**Synopsis**

This course is designed to examine management accounting and related analytical methodologies for decision making and control in profit-directed organizations, to frame accounting and financial issues, including the broader environment in which an enterprise operates. The purpose of this course is to advance student understanding of how to use financial information to value and analyse, and further aiding for entrepreneurship decision. Key topics in managerial accounting are addressed next. Other topics include Corporate risk management and due diligence, and determinants of cost structure will be highlighted.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Evaluate financial statements for entrepreneurship decision.

CO2: Construct leveraging portfolio for corporate risk assessment.

CO3: Authenticate principles and ethical values in investment decision.

**MKK1183 Managing Business Intelligence (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

**Synopsis**

This course intends to provide strategies in managing business and making intelligence decision. It focuses on global sourcing of professional services which covers areas of global sourcing models, the design and implementation of a sourcing strategy. Other topics include business process management and reengineering,

business negotiation strategies, business law and ethical and organizational trusts. Students will be exposed to various case studies, locally and internationally.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Evaluate the strategies of managing business intelligence decision in sustaining productive industrial operability and quality management.

CO2: Develop business process management plan

CO3: Consult a business negotiation effectively

chemistry

CO3: Identify the varieties of chemical products in the chemical product design (micro structured products and specialty chemicals)

### **MKK1313 Chemical Product Design and Management (Elective);**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This course introduces the chemical product design and management. It includes the extension of chemical engineering design to encompass both process design and product design. The design approach is based on the four-step procedure for chemical product design such as needs, ideas, selection, and manufacturing. Several case studies in the chemical product design are presented with special emphasis on the specialty and fine chemicals.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Develop a sample based on chemical product design approach

CO2: Recognize the phases of the chemical product design and differences from industrial process

## CURRICULUM STRUCTURE BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (PETROLEUM) WITH HONOURS

YEAR	FIRST SEMESTER				SECOND SEMESTER				THIRD SEMESTER		FOURTH SEMESTER	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND		
COURSES	UHL2400 Fundamentals of English Language	BUM1223 Calculus	UHL2422 English for Technical Communication	UHL2432 English for Professional Communication	BTO3224 Geometrical Dimensioning & Tolerancing	BTO4283 Dredging Processes	BTO4723 Elective II	BTO4812 Industrial Training				
	BTU1113 Physics	UHL2412 English for Academic Communication	BUM2113 Applied Mathematics	BUM2413 Applied Statistics	BTO3343 Computer Integrated Manufacturing	BTO3213 Well Drilling & Completion	BTO4733 Elective III					
	BTU1112 Physics Laboratory	UHC1012 Falsafah dan Isu Semasa	UQ2**1 Co-Curriculum II	BTO3013 Strength of Materials	BTV3413 Industrial Quality Control	BTO4253 Offshore Oil Mechanics	BTO3263 Offshore Engineering					
	BTU1213 Chemistry	BTO1313 Manufacturing Computer Applications	UHC2022 Penghayatan Etika Dan Peradaban	BTM1223 Engineering Dynamics	BTO3043 Fluid Mechanics	BTO3813 Final Year Project I	BTO4826 Final Year Project II					
	BTU1212 Chemistry Laboratory	BTO1213 Engineering Mechanics	BTO2314 Computer Aided Design	BTO3023 Properties of Materials	BTO3243 Subsea Engineering	BTO4713 Elective I	BTO4122 Project Management					
	BTO1113 Introduction to Mechanical Engineering	BTE1112 Electric & Electronics Fundamentals Laboratory	BTO2323 Computer for Engineers	BTO3133 Numerical Control Systems	BTO2073 Engineering Economy	BTO3273 Floating Structures	UGE2002 Technopreneurship					
	BTE1113 Electric & Electronics Fundamentals	UHF1**1 Foreign Language I	BTO3003 Thermodynamics	UHS1022 Soft Skills	BTO2073 Engineering Economy	BTO3273 Floating Structures	UGE2002 Technopreneurship					
	BUM1113 Technical Mathematics		UHF2**1 Foreign Language II									
	<b>TOTAL CREDIT PER SEMESTER</b>	<b>19</b>	<b>17</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>18</b>	<b>19</b>	<b>12</b>			
	<b>OVERALL TOTAL CREDIT FOR GRADUATION</b>	<b>142</b>										

**ELECTIVE COURSES FOR  
BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (PETROLEUM) WITH  
HONOURS**

No	Code	Course	Credit Hour
1	BTO3123	Environmental & Waste Technology	3
2	BTO3143	SHE In Petroleum Industry	3
3	BTO3823	Energy Reserve and Enhance Oil recovery	3
4	BTO3843	Optimal Liquefied Natural Gas (LNG) Operation	3
5	BTO3893	Reservoir Characterization and Simulation	3
6	MMT7143	Geology and Mineral Economic	3
7	MMT7133	Excavation and Geo Mechanics	3
8	MMT7313	Ethics, Safety and Regulation In Mining	3
9	MMT7223	Environmental Impact Assessment	3
<b>Total Credit Hours (3 Courses)</b>			<b>9</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	To successfully implement design and construction of mechanical and petroleum systems, commission, control systems, system integration and computer-based systems to serve government agencies, national and international industries.
PEO2	To critically evaluate and apply alternate assumptions, approaches, and procedures of petroleum and offshore drilling technologies and systems for applications deployment including well logging.
PEO3	To engage in lifelong learning and new knowledge development in engineering technology (mechanical and petroleum technologies).
PEO4	To produce engineering technologist with good technical management skills, good professional ethics and understanding local law in oil and gas industry.

**PROGRAMME OUTCOMES (PO)**

PO1	<b>Knowledge</b> Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to defined and applied engineering procedures, processes, systems or methodologies.
PO2	<b>Problem analysis</b> Solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to their discipline or area of specialization.
PO3	<b>Development of solutions</b> Design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	<b>Investigation</b> Plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.



PO5	<p><b>Modern Tool Usage</b> Select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.</p>
PO6	<p><b>Individual and Teamwork</b> Function effectively as individuals, and as members or leaders in diverse technical teams.</p>
PO7	<p><b>Communications</b> Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.</p>
PO8	<p><b>The Engineer and Society</b> Communicate effectively within the engineering community and society at large</p>
PO9	<p><b>Ethics</b> Demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices</p>
PO10	<p><b>Project Management and Finance</b> Demonstrate an awareness of management, business practices and entrepreneurship</p>
PO11	<p><b>Environment and Sustainability</b> Demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.</p>
PO12	<p><b>Lifelong Learning</b> Recognize the need for professional development and to engage in independent and lifelong learning.</p>

**COURSE SYNOPSIS****BACHELOR OF MECHANICAL  
ENGINEERING TECHNOLOGY  
(PETROLEUM) WITH HONOURS****CORE FACULTY****BTU1112****Physics Laboratory****Credit: 2****Prerequisites: None****Synopsis**

This laboratory introduces the students with the application of physics concepts in engineering devices such as Free Fall, Bernoulli's Law, Hydrostatic Pressure And Electric Field. The concepts of physics introduced in mechanics or dynamics motion and basic concepts of electrical area. The students will learn how to run the experiment by referring to the basic concepts of physics during the lab hours.

**Course Outcome**

CO1 Understanding the basic concepts, theories and principles of physics in engineering application

CO2 Demonstrating skills in logical thinking in handling equipment.

CO3 Applying basic physics concepts to problem solving

CO4 Applying physics knowledge to personal decisions involving physical problems

**BTU1113****Physics****Credit: 3****Prerequisites: None****Synopsis**

Physics is about the fundamental natural laws governing our universe. Taken as a whole, physics can be considered as the behaviour of

just two fundamental quantities (space-time and mass-energy) in the presence of just four fundamental forces (gravitational, electromagnetic and strong and weak nuclear forces). Using physics, a small set of profound natural laws thus can be used to make sense of the complexities of the natural world, as well as the design and operation of our technology. Physics can be divided into different fields of study, with "classical physics" covering mechanics, acoustics, thermodynamics, electromagnetism and optics, and "modern physics" encompassing relativity and the quantum mechanics of light of matter. This course examines the conceptual basis of statics, dynamics, electric and magnetism. In this course students are provided with an introduction to key concepts, and obtain practice with relevant problem solving.

**Course Outcome**

CO 1 Illustrate basic concepts, theories and principles of physics in engineering application

CO 2 Investigate physics problem in statics, energy and fluid mechanics

CO 3 Demonstrate physics concepts of electric and magnetism

**BTU1212****Chemistry Laboratory****Credit: 2****Prerequisites: None****Synopsis**

In chemistry laboratory the students are responsible to conduct the basic physical, organic chemistry and analytical instrument experiments such as solubility miscibility (1), chemical equilibrium (2), buffer and pH changes (3), calorimetry (4), gravimetric (5), Limiting reactant (6), Reaction rate (7), Extraction with solvent (8), UV-VIS spectrometer (9), and Melting Point (10). At the end of experiments, the students should be able to inculcate critical thinking and be able to work in safe working conditions.

**Course Outcome**

- CO1 Apply physical, organic & analytical chemistry theory in laboratory
- CO2 Apply the basic science and analytical chemistry knowledge in operation of analytical chemistry equipment.
- CO3 Able to demonstrate and operate each analytical equipment base on the theories applied in analytical chemistry
- CO4 Able to indicate any minor/major malfunction of equipment, incorrect step/ result & troubleshoot it

**BTU1213****Chemistry****Credit: 2****Prerequisite: None****Synopsis**

Development of the fundamental principles and concepts of chemistry by lecture-demonstration, as well as the development of an appreciation of the nature of chemistry as a science. An historical development of the most important concepts and ideas. Methods and limitations of chemistry, its evolution and discussions of the problems currently being solved and created.

**Course Outcome**

- CO1 Apply the basic knowledge about physical, inorganic and analytical chemistry.
- CO2 Relate chemical concepts and principles while presenting a broad range of topics in a clear and concise manner.
- CO3 Develop problem solving and critical thinking skills on general chemistry.

**BUM1113****Technical Mathematics****Credit:3****Prerequisites: None****Synopsis**

This course introduces and discusses the fundamentals of mathematics focusing on providing a solid theoretical foundation for further work. Students are exposed to complex numbers, functions and graphs, trigonometric functions, analytic geometry, polar coordinates, 3 dimensional spaces and vectors. Appropriate software is used by students to implement some of these ideas in practice.

**Course Outcome**

- CO 1 Acquire fundamental principle of functions and trigonometric
- CO 2 Apply appropriate mathematics concepts to solve various problems.

**BUM1223****Calculus****Credit:3****Prerequisites: None****Synopsis**

This course discusses Differentiation and applications, techniques of integration and applications, numerical integration and Taylor polynomial, Taylor Series & Maclaurin Series.

**Course Outcome**

- CO 1 Understand the fundamental concepts of calculus and connect them with the real world problem.
- CO 2 Solve any related problem involving differentiation and integration.
- CO 3 Apply the concepts and methods studied into other related courses.
- CO 4 Communicate effectively in written and oral form through group discussion.
- CO 5 Attain computational facility in differential and integral calculus.

**BUM2113****Applied Mathematics****Credit:3****Prerequisites: None****Synopsis**

This course introduces ordinary differential equations (analytically and numerically), Laplace transforms and Fourier series. Related applications are also discussed.

**Course Outcome**

- CO 1 Acquire fundamental principle of first and second order ordinary differential equations, Laplace transforms, numerical method to solve initial and boundary value problem and Fourier series
- CO 2 Analyse and solve various differential equations of first and second order differential equations, Laplace transforms, numerical method and find Fourier series for various periodic functions

**CORE PROGRAM****BTO1113****Introduction to Mechanical Engineering****Credit: 3****Prerequisites: None****Synopsis**

This course will introduce students to the Mechanical Engineering Technology (Petroleum) as well as providing a brief introduction to materials science, and showing what role materials play for Mechanical Engineers. For the petroleum technology, it will discuss about exploration and production of petroleum (oil & gas), processing and transportations at upstream, midstream and downstream segments.

**Course Outcome**

- CO1 Analyze petroleum systems and technologies by applying knowledge of mathematics, basic science and engineering
- CO2 Relate petroleum systems, technologies and processes to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- CO3 Communicate effectively and function on multidisciplinary teams.

**BTO1213****Engineering Mechanics****Credit: 3****Prerequisites: None****Synopsis**

This course introduces the force vector algebra, equilibrium of forces on particle, equilibrium of forces on single rigid body and simple force analysis on simple frames and problems involving dry friction.

**Course Outcome**

- CO1 Apply the basic concepts in statics to solve problems concerning resultant of forces acting on a particle and equilibrium of a particle
- CO2 Analyze problems involving the equilibrium of a single rigid body
- CO3 Explain equilibrium of rigid bodies to solve a technical problem in technical language

**BTO1313****Manufacturing Computer Applications****Credit: 3****Prerequisites: None****Synopsis**

Overview of computer hardware, software,

and processing concepts related to the control of manufacturing tasks. Emphasis on use of integrated software packages in the solution of a variety of manufacturing problems. Laboratory assignments in automation control, real time data sampling, and creation of user interfaces.

### Course Outcome

- CO1 Introduction to the hardware and software
- CO2 Analyze the programming language of microcontroller
- CO3 Demonstrate the advanced function of Microcontroller
- CO4 Develop manufacturing application software

## BTE1112

### Electric & Electronics Fundamentals Laboratory Credit: 2

**Prerequisites: None**

### Synopsis

This course introduces students to the fundamentals laboratory of DC and AC circuits and basic network laws and theorems. The students will be handling the basic measurement equipment to measure and analyse the parameter of the electrical circuits.

### Course Outcome

- CO1 Construct simple electrical and electronics and simulate the operation of the circuits using circuit simulation software.
- CO2 Measure parameter of electrical circuits-resistance, voltage, current,
- CO3 Work ethically and effectively as an individual and in a group

## BTE1113

### Electric & Electronics Fundamentals

**Credit: 3**

**Prerequisites: None**

### Synopsis

This module will introduce students to basic science of electricity, introduction to instrumentation and measurement, work and energy theorem, basic electrical circuit and introduction to magnetism.

### Course Outcome

- CO1 Analyze the basic concept of electricity, conductors, insulators, circuit, magnetism and other devices
- CO2 Apply basic electrical laws such as Ohm and Kirchhoff Law to solve circuit or electrical problems
- CO3 Shows the ability to communicate effectively

## BTO2323

### Computer for Engineers Credit: 3

**Prerequisites: None**

### Synopsis

This module will introduce students to programming course that uses MATLAB to illustrate general concepts in computer science and programming. MATLAB is a special-purpose language that is an excellent choice for writing moderate-size programs that solve problems involving the manipulation of numbers. The design of the language makes it possible to write a powerful program in a few lines. Student will become familiar with general concepts in computer science, gain an understanding of the general concepts of programming, and able to apply the knowledge to troubleshoot/diagnose and maintain computer system involving related engineering equipment computer interfaces.

### Course Outcome

- CO1 Organize and analyze the data by using Matlab
- CO2 Analyze, understand and

develop the program to solve the mathematical problems

CO3 Apply software to solve general chemical engineering and mathematical problems

CO4 Demonstrate the ability in transforming the problem to design and from design to an operational program

### **BTO2314**

#### **Computer Aided Design**

**Credit: 4**

**Prerequisites: None**

#### **Synopsis**

This course introduces the usage of Computer Aided Design (CAD) software, AUTOCAD. Students will be exposed and be familiar with the software environment and utilizing the basic and advanced tools to come out with a standard technical drawing especially for chemical engineering related applications.

#### **Course Outcome**

CO1 Analyze the capabilities, limitations and procedures for CAD software

CO2 Ability to perform the CAD software in basic and advanced working tools mode for complex technical drawing

CO3 Manage to apply the CAD software tools in order to create technical 3D drawings for chemical engineering equipment

CO4 Display geometric dimensioning and tolerancing in working drawing

### **BTO3133**

#### **Numerical Control Systems**

**Credit: 3**

**Prerequisites: None**

#### **Synopsis**

A study of the principles, techniques, and applications of computer numerically controlled machine tools. G and M code

programming of industrial machines, tooling systems, and an introduction to Computer Aided Manufacturing (CAM) systems will be covered.

#### **Course Outcome**

CO1 Produce fundamental manual G-code programs, for various machining applications, including spindle speeds, and feed rates

CO2 Operate an absolute and incremental tool positions for machining canned cycle operations, linear and circular interpolation and subprograms.

CO3 Use a PC to prepare, edit and print a machine readable part program and use a CNC machine to verify and machine a basic part.

CO4 Produce job operation files, shape profiles, generate machine code, verify tool path using computer simulation CAM software

### **BTO3013**

#### **Strength of Materials**

**Credit: 3**

**Prerequisites: None**

#### **Synopsis**

The purpose of teaching Strength of Material is to provide student with the understanding of mechanical behavior is essential for the safe design of all structures. This course enables students to examining the stresses and strains that occur inside real bodies that deform under loads.

#### **Course Outcome**

CO1 Apply the knowledge to Determine axial and bending stress and strain, as well as torsion stress and strain and Hooke's law

CO2 Construct experiment to investigate

material properties and strength of material

CO3 Report the usage of factor of safety and its application to the real problem

CO4 Justify the problem of stress and strain and its effect to environment

**BTO1223**  
**Engineering Dynamics**  
**Credit: 3**

**Prerequisites: None**

**Synopsis**

This course intended to introduce the basic principles including friction and motion of a point in both one and two dimensions, as well as rigid body motion.

**Course Outcome**

CO1 Ability to understand and apply properties of friction.

CO2 Ability to determine velocity and acceleration of a given particle in one and two dimensions.

CO3 Ability to determine rectilinear and curvilinear motion.

CO4 Ability to determine angular and linear velocity and acceleration.

CO5 Ability to apply acceleration and velocity concepts to rigid body motion.

**BTO2073**  
**Engineering Economy**  
**Credit: 3**

**Prerequisites: None**

**Synopsis**

This course deals with cost analysis in engineering decision-making, the management aspects and control of complex projects. Engineering economics topics include cost estimation, time value of money,

interest formulas and equivalence calculations, measures of investment worth, depreciation and income tax analysis.

**Course Outcome**

CO1 Apply the basic engineering economy, the cost concept and the cost estimation

CO2 Analyze the money-time relationship

CO3 Analyze the depreciation and the after-tax cash flow

**BTO3003**  
**Thermodynamics**  
**Credit: 3**

**Prerequisite: None**

**Synopsis**

This subject is designed to introduce the basic concept in thermodynamics. Topics that will be covered in this subject include the properties of pure substances, thermodynamics system, the First Law of Thermodynamics for closed systems, open systems and their application in steady-flow and unsteady-flow processes, The Second Law of Thermodynamics, entropy, introduction to refrigeration, heat engine, and heat pump.

**Course Outcome**

CO1 Discover the state of properties from property diagram and obtaining data from property table

CO2 Solve energy balance for both closed and open system using the First Law of Thermodynamics

CO3 Analyze cyclic devices (heat engine, heat pump and refrigerator) and isentropic processes of steady flow devices using the Second Law of Thermodynamics

CO4 Demonstrate the relationship between thermodynamics behavior and properties via experimental work and laboratory report

**BTO3043****Fluid Mechanics****Credit: 3****Prerequisites: None****Synopsis**

This course consists of fundamental of fluid mechanics and fluid power system. Fundamental element of fluid mechanics including properties of fluid, fluid in static and fluid in motion. Fluid power system element including fluid power principles, devices, materials, hydraulic and pneumatic systems with emphasis on pumps, compressors, motors, and actuators. The module goal is to enable the student to develop the knowledge and analytical skills in solving practical problems of fluid mechanics and fluid power system, through applications to system design and performance studies.

**Course Outcome**

- CO1 Use the fundamental of fluid mechanics and fluid power including properties of fluid, fluid flow, hydraulics system and pneumatics system to solve problems in both of these fields
- CO2 Analyze and solve problems in fluid mechanics by applying suitable equations
- CO3 Demonstrate theoretical and experimental data in spoken presentation and written lab report in order to to understand the fundamental concept of fluid mechanics

**BTO3213****Well Drilling & Completion****Credit: 3****Prerequisites: None****Synopsis**

The course covers the fundamentals of drilling engineering and well completion. In the area

of drilling; the following are covered: the drilling process; equipment and performance; well control procedures; fluid design; well casing design and cementing process; overview of drilling operations. Well Completions addresses: the course covers the fundamental principles of the design well completions, casing design in various loading condition with various downhole situations, cementing techniques, placement of casing, liners and well tubing. Lectures also cover types of perforations, tubing string and its accessories, production packer and tubing sealing assemblies that should be installed in production wells to produce oil and gas safely to the surface and introduction to well stimulation. This course is conducted through lectures, group assignments and practical test.

**Course Outcome**

- CO1 Effectively describe petroleum well drilling and completion principles, including key features of various components, and use these descriptions in appropriate for design, analysis and evaluations
- CO2 Recognize, identify and analyse the problems involved during drilling operation, identify key design parameters, and estimate them appropriately; and solve the relevant problems through analysing, evaluating and synthesising information
- CO3 Ability to approach problems in a logical way (theory & practical), be able to formulate an optimum solution and decide what data / information is relevant from a range of sources, how these relate to each other and identify inconsistencies
- CO4 Ability to conduct related experiments and to work as a part of the team through successful completion of a group project

**BTV3413****Industrial Quality Control****Credit: 3****Prerequisites: None****Synopsis**



Fundamental concepts and principles of quality and continuous improvement in manufacturing and service industries, developed by the various quality gurus (Deming, Juran, Feigenbaum, Ishikawa etc.). The use of control charts and statistical tools to determine stability and capability of processes to produce quality product. Defining and quantifying the various forms of quality costs.

### Course Outcome

CO1 Planning the implementation of the principles of quality control and continuous improvement to ensure customer satisfaction and global competitiveness

CO2 Analyzing the various quality costs in industrial processes and implementing appropriate quality management tools to eliminate the same

CO3 Engage in independent and lifelong learning about industrial quality control and continuous improvement

### BTO3023

#### Properties of Materials

**Credit: 3**

**Prerequisites: None**

#### Synopsis

This course intends to provide the details of engineering materials, their history, structures, properties, applications. This knowledge will be further useful to make intelligent selection of materials for different applications.

#### Course Outcome

CO1 Demonstrate basic knowledge, properties and areas of applications of engineering materials.

CO2 Analyze material properties of structure for different applications.

CO3 Choose suitable material processing methods.

### BTO3224

#### Geometric Design and Tolerancing

**Credit: 4**

**Prerequisites: BTO2314**

#### Synopsis

This course provides a basic understanding of the concepts and methods in petroleum geology in use in today's exploration and development programs. Among the topics, we will cover are sedimentary basins, origin, and migration of hydrocarbons, reservoirs, traps, and seals, and geological methods used in exploration and development. Embedded lab sessions, industrial speaker, and mini project will supplement lectures and offer practical experience with methods and concepts.

#### Course Outcome

CO1 Explain the fundamental concepts of petroleum geology such as basic rock types and basic geological principles controlling the nature, occurrence and accumulation of petroleum

CO2 Understand the main characteristics of petroleum geochemistry, petroleum reservoirs and resources

CO3 Identify the fundamental terms, principles, and tools of petroleum geoscience

CO4 Apply the knowledge of geoscience to solve the mini project

### BTO4253

#### Offshore Oil Mechanics

**Credit: 3**

**Prerequisites: None**

#### Synopsis

This course introduces the application of principles of soil mechanics. Students will be exposed to the following topics: the origin and nature of soils; soil classification; the effective stress principle; hydraulic conductivity and

seepage; stress-strain-strength behavior of cohesionless and cohesive soils and application to lateral earth stresses; bearing capacity and slope stability; consolidation theory and settlement analysis; and laboratory and field methods for evaluation of soil properties in design practice.

### Course Outcome

- CO1 Demonstrate the relationships between physical characteristics and mechanical properties of soils to be applied in field development
- CO2 Demonstrate skills in logical thinking in handling equipment
- CO3 Apply the modeling and analysis techniques used in soil mechanics: (a) Darcy's Law and flow-nets for seepage; (b) consolidation models for load-time-deformation responses of soils; (c) Mohr-Coulomb models for shear strength behavior of soils, to problem solving.

### BTO3263

#### Offshore Engineering

**Credit: 4**

**Prerequisites: None**

#### Synopsis

This course introduces the fundamental technologies of petroleum production and transmission. Petroleum production includes the design, evaluation, optimization, reservoir inflow performance prediction, near-wellbore damage, completion performance, and well deliverability. For transmission technology, flow in wellbore and pipelines, surface facilities, stimulation, and transportation are covered.

#### Course Outcomes

- CO1 Identify production performance for vertical and horizontal wells in oil/gas field and two-phase

reservoirs including reservoir inflow and wellbore flow

- CO2 Determine the wellbore problems in oil and gas well production cause by formation damage
- CO3 Understand the concept of artificial lift, flow through tubing and flowlines and separator in the offshore field
- CO4 Conduct related experimental work related to the oil and gas production

### BTO3273

#### Floating Structure

**Credit: 3**

**Prerequisites: None**

#### Synopsis

This course provides an introduction to the fundamentals involved in floating structure design: hydrostatics and stability, hull structure, global design and sizing, mooring, global responses and an overview of structure fabrication, transportation and installation methods. The proper design of these platforms is essential for the survival of the risers and the safety of the people that operate the platforms. The scope of specific platforms include: semi-submersibles, tension-leg-platforms (TLPs), spars, and FPSO (ship-shaped). The content is based largely upon application of Rule and Recommended Practice-based methods. The use of "first principles" in the design is discussed as well.

#### Course Outcome

- CO1 Configure floating structures and moorings to meet their function and safety
- CO2 Identify the methods for design and analysis of floating structures
- CO3 Recognize applicable Industry Standards, the role of Classification Societies, and application of the Rules, particularly, to hull stability, structure, and mooring design

**BTO3243****Subsea Engineering****Credit: 3****Prerequisites: None****Synopsis**

Reservoir description techniques using petrophysical and fluid properties; engineering methods to determine fluids in place, identifying production drive mechanisms, and forecast reservoir performance; implementation of pressure maintenance schemes and secondary recovery. The course will be focusing more on practical application of science and engineering to a wide range of real-world reservoir engineering problems.

**Course Outcome**

- CO1 Understand the main terminology, concepts and techniques of reservoir engineering technology, petrophysical and fluid properties
- CO2 Analyze the fractional flow theory, strategies and displacement performance calculations to the primary, secondary and enhanced oil recovery
- CO3 Conduct experiments related to reservoir properties and characterization

**BTO3343****Computer Integrated Manufacturing****Credit: 3****Prerequisites: None****Synopsis**

This course intends to apply the knowledge of computer integrated manufacturing systems utilized by industry, including automated flow line, material handling system, system control, programmable logic control, robotics, computer-aided manufacturing, computer-aided design/drafting, computer-aided

testing/inspection, and computer-aided process planning. At the end of this course the students will have sound knowledge of how each of these areas interact with production and business in a competitive world.

**Course Outcome**

- CO1 Describe the importance of automation in industry and key elements of computer integrated manufacturing systems.
- CO2 Analyze manufacturing operations that can combine with various elements of computer integrated manufacturing
- CO3 Adapt manufacturing system and manual labor process prior to create and propose their own customized CIM system

**BTO4283****Dredging Process****Credit: 3****Prerequisites: None****Synopsis**

This course introduces the general knowledge on dredging with an emphasize on design and operation of various dredging equipment. It covers all aspects of dredging such as dredging processes, equipment selection, soil characteristics, automation and control, and dredge project management; preparation and execution of dredging projects, operation and maintenance of dredging equipment.

**Course Outcome**

- CO1 Explain how dredging is undertaken, including descriptions of the equipment used and detailed explanations of the different stages/components of a dredging project
- CO2 Demonstrate skills in handling dredging equipment based on the theories
- CO3 Apply concepts and key elements in the dredging processes to tackle challenges in ocean environment and improve the performance

**BTO3823****Energy Reserve and Enhance Oil Recovery (E)  
Credit: 3****Prerequisites: None****Synopsis**

The course covers Understanding major issues associated with important elements of the energy value chains, including global energy efficiency, long term cost and availability of petroleum, climate change concerns, role of marginal suppliers and buyers in setting prices, role of the OPEC cartel in oil pricing, dealing with the inherent uncertainty associated with oil and gas exploration and production, dealing with the inherent uncertainty and reliability concerns associated with supply, demand and distribution of electricity, and commercializing major changes in energy technology. In this course, students are introduced to the important concepts, theories, and methods of enhanced oil recovery (EOR). This course covers the general classification of EOR processes, microscopic displacement of multiphase fluids in porous media, the concept of mobilization and trapping of oil, mobility ratio and capillary number. Also included are the important concepts and operational procedures of various types of EOR methods such as polymer flooding, chemical flooding, miscible and immiscible gas flooding and thermal recovery processes.

**Course Outcome**

- CO1 Define the world energy reserve and understand the concept of energy reserve and the involvement of energy reserve for world population usage
- CO2 Determination of energy reserve with current technology and new technology approach
- CO3 Recognize the importance of energy reserve and enhance oil recovery in petroleum industry

**BTO3123****Environmental & Waste Technology (E)  
Credit: 3****Prerequisites: None****Synopsis**

This subject is designed to introduce to the students the principle of environmental technology and current environmental problems. Topics include water pollution, wastewater quality management, wastewater treatment, air, solid waste treatment and management that related to petroleum industry. The techniques covered involved in environmental samples testing, and an ability to critically evaluate data from a sampling program. The student will learn how to develop an activity using various strategies to control, reduce and monitor all environmental problems.

**Course Outcome**

- CO1 Be able to identify and value the effect of the pollutants on the environment (atmosphere, water ,soil) and expose to environmental legislation & regulation practices in Malaysia
- CO2 Propose and review the choice of different environmental technical solutions in order to solve or minimize pollutions to air and water from industrial production processes
- CO3 Analyze the concept and analytical methods involved in management of solid, air, water and hazardous waste

**BTO3843****Optimal Liquefied Natural Gas (LNG) Operation (E)  
Credit: 3****Prerequisites: None****Synopsis**

This course provides students with knowledge and computational skills about optimal Liquefied Natural Gas (LNG) operation. It emphasizes LNG production system that include raw gas conditioning and NGL

recoveries, liquefaction technologies, operational control and safety, logistics and terminals. Analysis of the processes will be using Aspen HYSYS software while improvements through optimization will use GAMS software. Innovations in the LNG industry are also highlighted and discussed.

### Course Outcome

- CO1 Explain about LNG basics and the LNG industry in Malaysia and worldwide
- CO2 Analyze the processes for raw gas conditioning and NGL recovery
- CO3 Optimize LNG production system, logistic and terminal operations
- CO4 Discuss current innovations in the LNG industry

### BTO3893

#### Reservoir Characterization and Simulation (E)

**Credit: 3**

**Prerequisites: None**

#### Synopsis

This course provides students with solution of production and reservoir engineering problems using state-of-the-art commercial reservoir simulation software, using data commonly available in industry; emphasis on reservoir description, reservoir model design and calibration, production forecasting and optimization, economic analysis and decision making under uncertainty.

#### Course Outcome

- CO1 Explain how reservoir characterization simulation provide solution of production and reservoir engineering problems.
- CO2 Demonstrate skills in using state-of-the-art commercial reservoir simulation software using data commonly available in industry.
- CO3 Apply concepts and key elements in the reservoir simulation to tackle challenges in

reservoir description, reservoir model design and calibration, production forecasting and optimization, economic analysis and decision making under uncertainty.

### BTO4122

#### Project Management

**Credit: 2**

**Prerequisites: None**

#### Synopsis

This course deals with the management aspects and control of complex projects. Project management topics include knowledge on the life cycle of projects, project management processes, roles and responsibilities of project managers, planning, organization, time, cost, risk and quality management. This course also introduce software for project planning and scheduling that have been practiced in industry.

#### Course Outcome

- CO1 Explain theoretical and conceptual basis of project management body of knowledge and its practice
- CO2 Understand various activities and processes involved in managing an active project by using appropriate tools and techniques

### BTO3813

#### Final Year Project I

**Credit: 2**

#### Synopsis

This course is designed to expose the students to a research/development project. They have to apply all the knowledge they have learned in the program to complete the research project. Students will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor) in group. During the project I, the students will be able to do a literature survey and prepare a draft which contains objective of the project,

problem statement, literature survey, solving techniques, methodology, preliminary results, treatment of results and list of reference publications. At the end of this subject, the students are required to present the draft in a short seminar which will be evaluated by a faculty's panel.

### Course Outcomes

CO 01 Propose the project proposal on a chosen/given topic in the relevant area.

CO 02 Defend project proposal in formal oral presentation identifying key outcomes and conclusions.

CO 03 Function effectively as a member or leader in the diversified technical teams.

CO 04 Demonstrate a professional ethics and responsibilities towards the project.

CO 05 Propose financial and costing analysis.

CO 06 Revise relevant information independently and practice curiosity in exploring new information

### BTO4826

#### Final Year Project II

**Credit: 6**

#### Synopsis

This subject is the continuation of the subject Final Year Project I. In this subject, the students are required to collect and analyze data, propose solution, model the project, analyzing, conduct research, discussion and write the findings and conclusions. At the end of this semester, the students are required to produce a research project report and present it to faculty's evaluation panel.

### Course Outcomes

CO 01 Analyze the research problem and construct the solution based on the knowledge of mathematics, sciences and engineering technology fundamentals.

CO 02 Construct project according to the proposed research plan, schedule and estimated cost and solve the problems by using appropriate tools.

CO 03 Evaluate the findings within the scopes and objectives and write the technical paper based on the findings.

CO 04 Defend the research outcomes of project in a formal oral presentation.

CO 05 Demonstrate a professional ethics and responsibilities towards the project.

CO 06 Practice in life-long learning enhancing individual's soft skill through research activities.

CO 07 Practice effectively as a member or leader in the diversified technical teams.

CO 08 Manage project in multidisciplinary environments based on safety regulations

### BTO4812

#### Industrial Training

**Credit: 12**

**Prerequisites: None**

#### Synopsis

In industrial training, students will gain exposure to real industry practices that will help them visualize their tasks and job possibilities after graduation. All students are required to undergo industrial training for a specified period in the final semester of the fourth academic year. The performance of each student in undergoing industrial training will be evaluated by faculty staff, and representatives from the employer organization.

### Course Outcome

CO1 Identify and investigate problems at industry, and propose solutions using the acquired technical skills

CO2 Function effectively as an individual and a member in diverse technical teams.

CO3 Demonstrate professional & ethical commitment and responsibility in the workplace

CO4 Present the outcomes of industrial training in a formal oral and report writing presentation

CO5 Develop engineering technology solutions based on scientific and

engineering fundamentals

CO6 Relate the theoretical and practical aspects of engineering technology to the actual work environment

### **MMT7143**

#### **Geology and Mineral Economic Credit: 3**

**Prerequisites: None**

#### **Synopsis**

This course provides knowledge on geology and the meaning of rocks, minerals deposits including the formation, exploration for end evaluation.

#### **Course Outcome**

CO1 Interpret the fundamental concepts on geology, petrology and mineralogy and ore forming process

CO2 Classify the exploration method for, and evaluation of mineral deposits

CO3 Evaluate economic value of rocks and minerals and contribution to the national economy and society.

### **MMT7313**

#### **Ethics, Safety and Regulation In Mining Credit: 3**

**Prerequisites: None**

#### **Synopsis**

This subject explores ethical concerns in the mining industries, and the consequences of poor ethical decisions and non-compliance to universal ethical practice on business, industry and reputation. Topics that will be included are mining ethics, HSE (health, safety & environment) management, legislations and contribution of mining towards sustainable development. The ability to match between the theoretical and real behaviours is the key for the development of sustainable mining that fulfil the ethics, HSE and legal

requirement.

#### **Course Outcome**

CO1 Explain and comprehend the mining activity and sustainable development.

CO2 Explain mining ethics, HSE management and related legislation.

CO3 Explain and comprehend ethics, skills of teamwork and leadership

and minerals and contribution to the national economy and society

### **MMT7133**

#### **Excavation and Geomechanics Credit: 3**

**Prerequisites: None**

#### **Synopsis**

This course provides an insight into excavation processes, rock mechanics and soil mechanics principles related to excavation, equipment selection, product technology and post-excavation stability.

#### **Course Outcome**

CO1 Interpret the principles of surface excavation, underground excavation, rock mechanics and soil mechanics

CO2 Analyse the problems related to excavation process

CO3 Select the suitable equipment and technology used for excavation process.

### **MMT7223**

#### **Environmental Impact Assessment Credit: 3**

**Prerequisites: None**

#### **Synopsis**

This course discusses the updated guidelines prescribed by the Director General of

Environmental Quality in order to fulfil the requirements of environmental quality. It introduces guidance on self-regulation in the current practice by DOE to ensure the project proponent to be fully responsible and accountable in EIA project implementation.

### **Course Outcome**

CO1 The candidates will get the knowledge about environmental issues related to Mining, and all laws related to it.

CO2 Get the knowledge of writing reports regarding assessment of environmental issues

CO3 Candidates can investigate and solve problems related to environment



## CURRICULUM STRUCTURE BACHELOR OF TECHNOLOGY IN OIL AND GAS FACILITIES MAINTENANCE WITH HONOURS

YEAR	FIRST		SECOND		THIRD		SHORT SEM	FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND			
COURSES	BVF1113 Introduction to Oil & Gas Facilities	BVF1214 Oil & Gas Transportation System and Services	BVF2114 Equipment Maintenance Strategy	BVF2233 Lifting & Rigging Operations and Maintenance	BVF3*3 General Elective	BVF3214 Plant Commissioning & Shutdown	BVF3316 Final Year Project 2	BVF4112 Industrial Training	
	BVF1123 Ethics in Profession	BVF1223 HSE in Oil & Gas Industries	BVF2124 Field Instrument Devices & Control	BVF2**4 Elective 1	BVF3**4 Elective 3	BVF32*4 Elective 5			
	BVF1133 Emerging Technologies in Oil & Gas Industries	BVF1234 Welding and Inspection	BVF2213 Oil & Gas Project Management	BV 2**4 Elective 2	BV 3**4 Elective 4	BVF32*4 Elective 6			
	BVF1143 Technical Drawing & Computer Aided Design	BVF1243 Equipment Basic Care	BVF2143 Asset Integrity Management	BVF2294 Capstone Technopreneurship 1	BVF3034 Capstone Technopreneurship 2	BVF3254 Final Year Project 1			
	UQA2002 Co-Curriculum	UHL2442 Essential English	UHL2452 English For Vocational Purposes	UHF2111 Mandarin Language 2					
	UHS1022 Soft Skills	UHC2022 Penghayatan Etika Dan Peradaban	UHF1111 Mandarin Language 1						
	UGE2002 Technopreneurship								
	UHC1012 Falsafah Dan Isu Semasa								
	<b>TOTAL CREDIT</b>	<b>20</b>	<b>18</b>	<b>17</b>	<b>16</b>	<b>15</b>	<b>16</b>	<b>6</b>	<b>12</b>
	<b>TOTAL CREDIT FOR GRADUATION</b>	<b>120 (DKM/ DVM)</b>							

**ELECTIVE COURSES FOR  
BACHELOR OF TECHNOLOGY IN OIL AND GAS FACILITIES MAINTENANCE WITH  
HONOURS**

NO.	CODE	COURSE	CREDIT HOUR	
1	BVF2214	Pump Operation & Maintenance Supervision	4	<b>Rotating</b>
2	BVF2274	Compressor Operation & Maintenance Supervision	4	
3	BVF3174	Reciprocating Piston Engine Operation & Maintenance Supervision	4	
4	BVF3124	Gas Turbine Operation & Maintenance Supervision	4	
5	BVF3204	Steam Turbine Operation & Maintenance Supervision	4	
6	BVF3224	Alignment And Condition Base Monitoring	4	
7	BVF2284	Valve Operations, Maintenance & Troubleshooting	4	<b>Static</b>
8	BVF2244	Heat Exchanger Operations, Maintenance & Troubleshooting	4	
9	BVF3184	Fired Vessel Operation & Maintenance Supervision	4	
10	BVF3144	Storage Tank Operation & Maintenance	4	
11	BVF3234	Unfired Pressure Vessel Operation, Maintenance & Troubleshooting	4	
12	BVF3264	Piping and Flange Management	4	
13	BVF3113	Organizational Behaviour	3	<b>General Elective</b>
<b>TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION</b>			<b>27</b>	

\*Students need to choose either Rotating OR Static elective group

<b>PROGRAMME EDUCATIONAL OBJECTIVES (PEO)</b>	
PEO1	To produce oil and gas technologists who can perform oil and gas facilities maintenance related works including operation and maintenance specialists.
PEO2	To produce technopreneurs in oil and gas facilities maintenance related technology.
PEO3	To produce relevant, respected and referred professionals in oil and gas facilities maintenance technology.

<b>PROGRAMME LEARNING OUTCOMES (PLO)</b>	
PLO1	Apply knowledge of technology fundamentals to broadly-defined procedures, processes, systems and methodologies in the oil and gas facilities maintenance industry.
PLO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems.
PLO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in oil and gas facilities maintenance industry.
PLO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PLO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PLO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PLO7	Demonstrate an awareness of management and technopreneurship practices in real perspective.
PLO8	Demonstrate professionalism and social and ethical consideration.
PLO9	Demonstrate leadership quality, mentoring and work effectively in diverse teams.

## COURSE SYNOPSIS

### BACHELOR OF TECHNOLOGY IN OIL AND GAS FACILITIES MAINTENANCE WITH HONOURS

#### BVF1113

#### Introduction to Oil & Gas Facilities

Credit: 3

#### Synopsis

The objective of this module is to familiarize students with the overview of the oil and gas (O&G) industry. The course will focus on the understanding of the purpose and operating principles of the existing facilities in upstream, midstream and downstream sectors. At the end of the course, students should be able to classify the common equipment categories which are static, rotating and, control and instrumentations.

#### Course Outcomes

CO1: Explain the physical principles and the gas equations in perfect or real condition.

CO2: Apply basic thermodynamics concept to solve the problem related to applied physical chemistry

CO3: Explain the structure of surfaces and the phenomena of adsorption isothermal surfaces chemical processes.

#### BVF1123

#### Ethics in Profession

Credit: 3

#### Synopsis

This subject gives an overview of technologists, the profession and its requirements in the Malaysia scenario. Topics that will include ethics, management and contribution of technologists also generic skills and study skills. Code & Standards for hand on consisted in this subject as preparation as a technologist student. Plant visit and seminar as an exposure to the real field of oil and gas technologist. the basic knowledge on technopreneurship being introduced to prepare students for the basic understanding of technopreneur.

#### Course Outcomes

CO1: Able to understand the common organics structures, properties and reactions of aliphatic and aromatic hydrocarbons, alkyl halides, alcohol groups, carbonyl groups and amines.

CO2: Formulate chemical reactions and steps of mechanism for the synthesis and transformation of functional groups.

CO3: Discuss the bonding properties of carbon which cause it to be present in such a large number and variety of important compounds.

CO4: Explain the common types of reactions mechanism and modern synthesis techniques.

#### BVF1133

#### Emerging Technologies in Oil and Gas Industry

Credit: 3

#### Synopsis

The aim of this course is to expose the students how industrial revolution 4.0 is transforming the oil & gas sector by introducing various innovative and modern technologies which have the potential to reduce the financial and safety risks, hence improve operations, efficiency and revenues. The topics covered in this subject are data analytics, cloud computing, wireless technologies, Industrial Internet of Things (IOT) and sensors, artificial intelligence, augmented/virtual reality for training, automation and 3-D printing. By completing this course, students will comprehend the idea of how industry 4.0 is transforming the oil and gas industry and also the modern technologies employed to achieve this industry 4.0.

#### Course Outcomes

CO1: Explain what is the Industrial revolution 4.0 is all about and how this revolution transforming oil & gas

CO2: Identify the main components of technological advancement in IR 4.0 that employed in Oil & gas industry.

CO3: Improve communication and

teamwork skills through industrial visit, presentations and group assignment

**BVF1143**  
**Technical Drawing & CAD**  
**Credit: 3**

**Synopsis**

This course is introducing the usage of technical drawing as a standard and precise way to communicate the engineering ideas. Students will learn about the technicalities in technical drawing and get familiar with a standardized drawing according to the international standard (ISO 128). Furthermore, various aspects such as projections, dimensioning and sectioning etc in technical drawing will also be covered. Meanwhile the CAD software, specifically AutoCAD, specialized in technical drawing is also included as a tool to produce an accurate drawing. Students will be exposed and be familiar with the software environment and utilize the basic and advanced tools to come out with a standard technical drawing / working drawing especially in the oil and gas technology field. This course will also cover P&ID standard drawing using Microsoft Visio software

**Course Outcomes**

CO1: Demonstrate knowledge in technicalities of technical drawing for oil and gas related applications.

CO2: Demonstrate knowledge of the usage of CAD software in general technical drawing.

CO3: Apply the CAD software tools to create a working drawings relating to maintenance and services in oil and gas industries

**BVF1214**  
**Oil & Gas Transportation System & Services**  
**Credit: 4**

**Synopsis**

This course aims to provide technical knowledge and hands on exposure to students related to oil & gas transportation systems and services. These include oil and

gas pipeline technical services, technical engineering, fabrication, installation, testing and commissioning of piping systems. Students will also be exposed to the requirements for installation, codes and standards used in technical services and installation systems related to oil and gas activities. Other relevant topics such as procedures involved before executing any work or activities in oil and gas e.g. permit to work, job safety analysis (JSA), ATI & ATO also being introduced to students.

**Course Outcomes**

CO1: Explain the oil & gas transportation system services and perform related technical activities in oil & gas industry

CO2: Able to describe and perform the procedures involved in installation, fabrication, testing & commissioning activities in oil & gas transportation system

CO3: Able to describe and perform the correct procedure and work activities in oil & gas activities according to codes & standard and safety regulation

**BVF1223**  
**HSE in Oil and Gas Industries**  
**Credit: 4**

**Synopsis**

This course will provide the basic knowledge required for facilities maintenance in oil and gas industries. It is primarily to expose students with the fundamental concepts, practical aspects and applications of occupational safety and health (OSH) in maintenance activities. Among others, the students will be taught the fundamental application and day-to-day aspects of HSE for facilities maintenance. Local regulations related to HSE such as OSHA, FMA & EQA will also be covered. Major accident's case studies and lessons learnt will also be discussed in detail. We expect students will be able to understand inadequate maintenance and safety maintenance procedures have always been the major cause of catastrophic incidents in oil and gas industries. This course also aims to familiarize students with related legislations, Process Hazard Analysis (HIRARC), occupational health &

environmental toxicology, IECEx, and process safety management & maintenance hazards as well.

### Course Outcomes

CO1: Explain the scope of HSE and legislation involved in offshore and onshore activities in oil & gas industries

CO2: Explain waste & OSH management system, work place risk assessment & plan in oil & gas industries

CO3: Review and analyze the cause and effects of industrial incidents and maintenance hazard in oil & gas activities

### BVF1234

#### Welding & Inspection

Credit: 4

### Synopsis

The objectives of this course are to train students on welding techniques and inspection so that they can understand and identify the properties and processes associated with the different kinds of metalwork. Some common concepts taught in welding inspection courses includes types of welding, shielded metal, materials and equipment, methods and industry/testing standards.

### Course Outcomes

CO1: Explain the concept and methods of welding inspection

CO2: Able to justify the suitable method of different welding materials and NDT to be applied for assigned case/project

CO3: Demonstrate the ability to use tool/equipment for the inspection and testing of the given component safely base on standard practice

### BVF1243

#### Equipment Basic Care

Credit: 4

### Synopsis

This course provides students the knowledge of performing structured monitoring tasks based on an organized checklist and to carry

out minor maintenance and repairs in order to prevent unpredicted breakdowns. This course also exposes students to predict failure if data of equipment are gathered consistently and analyzed effectively. EBC focuses on the concepts of "Doing Basic Things Right" and proactively fixing any process or operation deviations, no matter how small they are.

### Course Outcomes

CO1: Prepare monitoring task based checklist

CO2: Perform inspection and minor maintenance and repairs in order to prevent unpredicted breakdowns

CO3: Construct report analysed gathered data to predict failures from the equipment

CO4: Present technical documents related to the Final Project

### BVF2124

#### Field Instrument Devices & Control

Credit: 3

### Synopsis

The fundamental of this course is to introduce the basic principle of instrumentations and control particularly in the oil & gas industry. The topics cover the principles of instruments measurement, maintenance and calibration procedure for parameters level, temperature, pressure and flow. At the end of this course, students are expected to be able to explain and the principle of field instrument devices operation, measurement and control as well as able to conduct instrumentation maintenance and calibration procedures. Students are able to prepare proper documentation for maintenance and calibration activities.

### Course Outcomes

CO1: Discuss the principle of field instrument measurement and basic process control in oil and gas industry

CO2: Perform the field devices and instrumentation measurement, control and calibration procedures.

CO3: Discuss findings and prepare workpack and technical close-out report for maintenance and calibration activities

**BVF2114**  
**Equipment Maintenance Strategy**  
**Credit: 3**

**Synopsis**

The understanding of the strategy in conducting equipment maintenance in oil and gas needs to be introduced to the student who will work closely with all the equipment in oil and gas industries. The best maintenance strategy for equipment and services need to be maintained and enhanced to have efficient processes and reduce operating cost. This subject also will bring the understanding of the student on the planning and best decision to be taken to increase the equipment performance and comply with the current practice in the oil and gas industries. Apart from this, students will also be exposed to the fundamentals of Total Productive Maintenance (TPM) and an overview of risk-based inspection. The TPM will bring students to understand more about the concept for maintaining equipment while RBI is a systematic inspection methodology that will help students in identifying the type of potential failures and the probability of failure propagation.

**Course Outcomes**

CO1: Explain the maintenance procedures and planning  
 CO2: Discuss the failure development and the correct maintenance strategy  
 CO3: Explain the critical analysis strategy

**BVF2233**  
**Lifting & Rigging Operation and Maintenance**  
**Credit: 3**

**Synopsis**

This course allows trainees to acquire skill and knowledge on Lifting and Rigging supervision through theory and practical sessions. Trainees are also to carry out practical lifting, rigging, knots and hitch assembling and dismantling. At the end of this course, students are expected to be able to know their responsibility and roles as a lifting operation supervisor, acts and regulations relating to the lifting and rigging as well as build a lifting plan,

calculate the capacity of the load and inspect the condition of the equipment before lifting.

**Course Outcomes**

CO1: Describe the functions of various type of lifting and rigging and equipment and their accessories  
 CO2: Determine the Safe Working Limit (SWL), Working Load Limit (WLL) and suitable equipment for lifting operation (  
 CO3: Perform lifting and rigging procedure, dismantling correctly and safely and its equipment maintenance  
 CO4: Present technical documents related to the work completed

**BVF2213**  
**Oil and Gas Project Management**  
**Credit: 3**

**Synopsis**

This subject will introduce the student to the type of contract awarded to contractors in the oil and gas industry. In these cases, contracts are awarded in the form of EPCC (engineering, procurement, construction and commissioning). Students will understand each phase in the EPCC contract, from preliminary works until hand over of the project to the client.

**Course Outcomes**

CO1: Explain the principles of project and project management  
 CO2: Describe the technical and managerial aspects of projects in the oil and gas industry  
 CO3: Apply the risk management techniques and evaluate the project risks within the oil and gas industry operations

**BVF3214**  
**Plant Commissioning and Shutdown**  
**Credit: 3**

**Synopsis**

The understanding of management practices in plant commissioning and shut-down. This class will provide the student with a thorough understanding of the management in

commissioning and shut-down of chemical plants from the view point and experience of industrialist. It will cover subjects such as plant shutdown management, inspection, and safety and risk commissioning and shutdown.

### Course Outcomes

CO1: Describe the stages and phases involved in plant commissioning, start-up and shut-down

CO2: Explain the managerial activities implemented during plant commissioning, and shut-down.

CO3: Analyze safety, health issues and the necessary actions to be taken for potential hazards during plant commissioning, start-up and shut-down.

### BVF2143

#### Asset Integrity Management

Credit: 3

### Synopsis

This course enables technologists to learn the fundamentals of asset integrity in the oil and gas industry. Technologists will be exposed to understand the material integrity as a key part in optimising engineering design and crucial to the long-term performance of equipment and facilities. Also selection of metals and non-metallic materials; corrosion mitigation and management of corrosion risks; and metallurgy.

### Course Outcomes

CO1 Explain and identify type of corrosion and material degradation

CO2 Able to differentiate corrosion control and protection in oil and gas industry

CO3 Propose and estimate life span of assets degradation in general

### BVF2234

#### Valve Operations, Maintenance & Troubleshooting

Credit: 3

### Synopsis

Valves of various designs and applications are encountered nowadays throughout petroleum

refining, petrochemical and process industries. This course provides students with a complete understanding of construction details and functioning of valves as well as strainer and steam trap. Students are able to do hands on to dismantle many valves, assemble them and conduct valves testing according to standards and safe working procedures. Interactive 3D models are used extensively throughout the course to illustrate how valves and their components work.

### Course Outcomes

CO1: Discuss the type, construction, function and operation of valves, strainer & steam trap

CO2: Perform assemble and disassembly of valves, strainer and steam trap and conduct valves testing

CO3: Construct and discuss findings by preparation of workpack and technical close-out report for maintenance and valves testing activities

CO4: Present findings and propose maintenance planning of valves

### BVF2244

#### Heat Exchanger Operations, Maintenance and Troubleshooting

Credit: 4

### Synopsis:

The course provides an insight into the principles, operations, maintenance and troubleshooting of heat exchangers through theory and practical sessions

### Course Outcomes

CO1: Understand the working concept of the heat exchanger

CO2: Operate (start up and shut down ) the heat exchanger while implementing safety

CO3: Troubleshoot the common problem of the heat exchanger

CO4: Perform maintenance or come out with the solution due to the error found

### BVF3134

#### Fired Vessel Operation & Maintenance Supervision

Credit: 4



**Synopsis:**

This course provides an overview of mechanical non-rotating, static equipment. The focus is on equipment selection and integrity of fired pressure vessels and their integration into the process scheme and control strategy in upstream and midstream oil and gas facilities. The course addresses code requirements focusing on ASME Boiler & Pressure Vessel code. The material of the course is applicable to field production facilities, pipelines, gas plants, and offshore systems.

**Course Outcomes**

CO1: Differentiate the types of fired vessels, its component, operation principle, most common applications and service conditions  
 CO2: Perform inspection activities on fired vessels and generate inspection and maintenance checklist  
 CO3: Discuss findings and propose maintenance planning via workpack and technical close-out report

**BVF3234**  
**Unfired Pressure Vessel Operation, Maintenance & Troubleshooting**  
**Credit: 4**

**Synopsis:**

This course exposed the students to acquire skill and knowledge on various types of Pipe and Fitting, Valves and Safety Valves, Strainer, Steam Trap and P&ID through theory and practical sessions. Hands-on practical on valve maintenance and inspection will be done according to correct and safe working procedures.

**Course Outcomes**

CO1: Differentiate the types of unfired pressure vessels, its component, operation principle, most common applications and service conditions  
 CO2: Perform inspection activities on unfired pressure vessels and generate inspection and maintenance checklist  
 CO3: Discuss findings and propose maintenance planning via workpack and technical close-out report

CO4: Present technical documents related to the work completed

**BVF3264**  
**Piping and Flange Management**  
**Credit: 4**

**Synopsis:**

This course aims to provide technical knowledge and hands on experience in the piping and flange management system commonly used in the oil and gas industry. These include the introduction to piping & piping components, bolted flange joint, piping maintenance, repair and inspection. Student will be exposed to the insulation & isolation involved in the piping system. Exposure on the piping support and piping drawing is also critical to ensure students are able to interpret and identify the symbol and coding used in the piping drawing. Students will also be exposed on the requirements for installation, codes and standards commonly used in the piping components installation, repair and inspection. Other relevant topics such as hydrostatic testing will also be introduced to the students.

**Course Outcomes**

CO1: Explain and identify piping system and fitting components and its related repair & inspection activities involved in oil and gas industry  
 CO2: Well versed & perform installation, repair and inspection activities on piping system, fittings and related components  
 CO3: Construct and discuss findings through workpack and technical report on related piping system and component project  
 CO4: Present the work activities during toolbox meeting and the project report

**BVF2214**  
**Pump Operation and Maintenance Supervision**  
**Credit: 4**

**Synopsis:**

The fundamental aim of this course is to introduce one of the rotating equipment employed in the oil & gas industry which is

pump. The topics covered in this course are introduction to pump, components and function, support systems as well as operation and basic maintenance. At the end of this course, students are expected to be able to explain and identify the components and function of the pump as well as be able to operate and maintain the pump.

### Course Outcomes

CO1: Explain the basic mechanisms, principles and applications of pump in oil & gas industry

CO2: Identify the components and function as well as conduct the basic maintenance and inspection of pump

CO3: Construct and discuss findings through workpack and technical report on pump maintenance work

CO4: Present technical documents related to the work completed

### **BVF2224**

#### **Compressor Operation and Maintenance Supervision**

**Credit: 4**

#### **Synopsis:**

The fundamental aim of this course is to introduce one of the rotating equipment employed in the oil & gas industry which is the compressor. The topics covered in this course are introduction to compressor, components & function, support systems as well as operation and basic maintenance. In addition, handling of precision measuring tools for the application in rotating equipment are introduced. At the end of this course, students are expected to be able to explain and identify the components and function of the compressor as well as be able to operate and maintain the compressor.

### Course Outcomes

CO1: Explain the basic operations, principles and applications of compressor in oil & gas industry

CO2: Perform basic maintenance and inspection for the compressor

CO3: Construct and discuss findings by preparation of workpack and technical close-

out report for maintenance and testing activities

CO4: Present workpack and technical close-out report for inspection and maintenance activities

### **BVF3114**

#### **Reciprocating Piston Engine Operation and Maintenance Supervision**

**Credit: 4**

#### **Synopsis:**

The fundamental aim of this course is to introduce one of the rotating equipments employed in the oil & gas industry which is reciprocating piston engine. The topics covers the principles operation and application of reciprocating piston engine, the components and function, support systems as well as exposure on the codes and standard used in the inspection and maintenance activities for this equipment. At the end of this course, students are expected to be able to explain and identify the components and function of reciprocating piston engine as well as able to execute work activities related to inspection and maintenance of reciprocating engine and prepare proper documentation for work inspection and maintenance work activities.

### Course Outcomes

CO1: Explain and identify the principles operation & applications of reciprocating piston engine and its component's functions and support system

CO2: Perform inspection and maintenance activities on engine components and support system

CO3: Discuss findings and propose maintenance planning via workpack and technical close-out report

### **BVF3124**

#### **Gas Turbine Operation and Maintenance Supervision**

**Credit: 4**

#### **Synopsis:**

This course provides understanding of the concepts related to design, installation, operation and maintenance of rotating

equipment focusing on gas turbines. The students will be exposed to hands-on practical training and develop into skilled and expert technologists in rotating equipment. This course also intent to empowers the students with knowledge of design and analysis if difficulty occurs in the industrial equipment by providing them with a balance intellectual and practical experiences

### Course Outcomes

CO1: Explain the operation principle of the gas turbine

CO2: Identify and differentiate the components and function in gas turbine

CO3: Conduct the basic maintenance and inspection

CO4: Present technical documents related to the work completed

### BVF3204

#### Steam Turbine Operation and Maintenance Supervision

Credit: 4

### Synopsis:

This course will cover the operating principles of steam turbines. Upon completion of this course, students will gain a thorough understanding of basic steam turbine component construction, various steam turbine configurations available as well as a fundamental knowledge of the auxiliary systems function. The course will provide detailed knowledge on steam turbine assembly, dismantling and a clear understanding of the component internals. Additionally, students will gain knowledge on maintenance requirements and troubleshooting issues. This fundamental knowledge will allow students to approach operation and maintenance activities with confidence.

### Course Outcomes

CO1: Describe and identify the basics of Turbine, principles of actions, types, and main components of steam turbine

CO2: Perform assemble and dismantle of steam turbine components using 3D models, cross-sectional views, and 3D animations

CO3: Construct and discuss steam turbine maintenance, troubleshooting and turbine

failures via workpack and technical report

CO4: Present findings and propose maintenance planning of steam turbine

### BVF3224

#### Alignment and Condition Based Monitoring

Credit: 4

### Synopsis:

This course provides understanding of the concepts related to installation, specification and monitoring of condition alignment on the facilities. The students will be exposed to hands-on practical training and develop the monitoring of the installation alignment condition of many facilities equipment. This course also intent to empowers the students with knowledge of design and analysis if difficulty occurs in the industrial equipment by providing them with a balance intellectual and practical experiences

### Course Outcomes

CO1: Explain the basic principles predictive maintenance tools and techniques.

CO2: Identify the vibration source, bearing defect, windings integrity, stator and rotor bars condition, rotor eccentricity.

CO3: Construct and discuss findings through workpack and technical close-out report for maintenance and practical activities.

CO4: Handling and practical session monitoring condition of equipment

### BVF3144

#### Storage Tank Operation & Maintenance

Credit: 4

### Synopsis:

This course discusses several types of common atmospheric storage tank used in the oil and gas industry. It covers the the components and function of the tank and support systems as well as exposure on the codes and standard used in the inspection, repair and alteration activities for this equipment. At the end of this course, students are expected to be able to explain and identify the components and function of storage tank as well as able to identify work activities

related to inspection and repair of storage tank and prepare proper documentation for work inspection before and after job execution.

### **Course Outcomes**

CO1: Explain and identify types of storage tank and its component and support system and applications

CO2: Perform inspection activities on storage tank and generate inspection and maintenance checklist

CO3: Discuss findings and propose maintenance planning via workpack and technical close-out report

## CURRICULUM STRUCTURE DIPLOMA IN CHEMICAL ENGINEERING

YEAR	1					2			3
	PRELIMINARY	FIRST	SECOND	THIRD	FOURTH	FIFTH			
COURSES	UHC2022 Penghayatan Etika dan Peradaban	DRK1113 Material & Energy Balances	DRK1123 Engineering Mechanics	DRK2263 Chemical Reaction (Embedded Lab)	DRK2233 Environmental Engineering	DRK3610 Industrial Training			
	UHL2442 Essential English	DRK1311 Introduction to Chemical Engineering	DRK1213 Thermodynamics	DRK2223 Transport Processes	DRK2254 Unit Operations (Embedded Lab)				
	DUK1113 General Chemistry I	DRK1333 Computer Application & Engineering Graphics	DRK1411 Basic Science & Engineering Lab	DRK2133 Fluid Mechanics	DRK2352 Plant Supervision				
	DUM1163 Elementary Mathematics	DRK1341 Analytical Instrumental Lab	DRK1421 Mass And Heat Transfer Lab	DRK2362 Plant Commissioning, Start-Up & Shut-Down	DRK2393 Process Instrumentation & Control (Embedded Lab)				
		DRK1322 Electrical Technology	DUK1123 General Chemistry II	DRK2372 Plant Safety & Health	DRK2524 Final Year Project				
		DUF1113 Physics	DUM2143 Advanced Calculus	DRK2382 Plant Utility	UQA1002 Co-curriculum				
		UHL2412 English for Academic Communication	UHC1012 Falsafah dan Isu Semasa	UGE1002 Entrepreneurship					
		UHS1022 Soft Skills	UHL2432 English for Professional Communication						
	TOTAL CREDIT PER SEMESTER	10	17	18	17	18	10		
	OVERALL TOTAL CREDIT FOR GRADUATION	90							

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	To produce graduates who practice in their chemical engineering or related engineering fields such as in plant operation and associated areas including safety, health and environment
PEO2	To produce graduates who possess chemical engineering knowledge and hands-on skills required to undertake supervision of a team and troubleshooting both in operation and maintenance and associated areas
PEO3	To produce graduates who engage in independent and life-long learning, demonstrate having a responsibility and commitment to the profession, community and society

**PROGRAMME LEARNING OUTCOMES (PLO)**

PLO1	<b>Knowledge</b> Apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialisation as specified in DK1 to DK4 respectively to wide practical procedures and practices.
PLO2	<b>Problem analysis</b> Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity (DK1 to DK4).
PLO3	<b>Design/development of solutions</b> Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations (DK5).
PLO4	<b>Investigation</b> Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements.
PLO5	<b>Modern Tool Usage</b> Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6).
PLO6	<b>The Engineer and Society</b> Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well-defined engineering problems (DK7).
PLO7	<b>Environment and Sustainability</b> Understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental contexts (DK7).
PLO8	<b>Ethics</b> Understand and commit to professional ethics and responsibilities and norms of technician practice; (DK7).
PLO9	<b>Individual and Team Work</b> Function effectively as an individual, and as a member in diverse technical teams.

PLO10	<b>Communications</b> Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions.
PLO11	<b>Project Management and Finance</b> Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environments.
PLO12	<b>Life Long Learning</b> Recognize the need for, and have the ability to engage in independent updating in the context of specialized technical knowledge.

**COURSE SYNOPSIS****DIPLOMA IN CHEMICAL ENGINEERING**

DRK1311

Introduction to Chemical Engineering

Credit: 1

**Synopsis**

This subject gives an overview of engineering, the profession and its requirements in Malaysia scenario. Topics included in this course are ethics, management and contribution of engineering, and generic skills and study skills. Students will participate in plant visits and seminars as exposure to the current issues and technology in the actual engineering field and adapt to the current engineering situation in the industry.

**Course Outcomes**

CO1 Define engineering & identify different branches of engineering.

CO2 Explain engineering ethics, management and contribution.

CO3 Keep up to date the current technology & issue in the engineering field

DRK1322

Electrical Technology

Credit: 2

**Synopsis**

This course is designed to introduce the fundamentals of electrical system principles. The underlying principles that will be covered in this course include an introduction to an electrical system, electrical safety, basic laws (Ohm's law, Kirchhoff's laws, current/voltage divider, wye-delta transformation), direct current (d.c.) circuits, methods of analysis, circuit theorems, single-phase series and parallel circuits, series and parallel combination of resistor, inductor and capacitor, power in AC circuits, multiphase systems, and also AC and DC motors. A part of that, the student also needs to carry out simple technical projects to assess their understanding of the basic principles of electromagnetism and its applications

**Course Outcomes**

CO1 Describe the concepts of the electrical system and its components as well as awareness on electrical safety.

CO2 Analyse and solve electric circuit problems both for direct and alternate currents.

CO3 Ability to implement the concepts of electromagnetism in students' project

DRK1411

Basics Science &amp; Engineering Lab

Credit: 1

**Synopsis**

In Basic Science and Engineering Laboratory, students are required to perform experimental works which covered the basic concept of physics and chemistry, such as concepts of solubility and miscibility, gravimetric analysis, buffer effect, dissociation constant estimation, specific heat and reaction heat determination, pressure change analysis and hardness testing.

**Course Outcomes**

CO1 Apply the basic science and engineering theories in the corresponding experimental works

CO2 Apply the basic science and engineering concepts in solving problems and interpretation of experimental data.

CO3 Adapt the team working behaviour and commitment as a member while working on the group assignment.

DRK1333

Computer Applications &amp; Engineering Graphics

Credit: 3

**Synopsis**

This course will cover computer software such as Microsoft Office, Excel and Visio. Other than that, engineering drawing and utilisation of computer aided design (CAD) software.

**Course Outcomes**

CO1 Demonstrate knowledge of Microsoft excel: VBA applications in the chemical



engineering equipment or related disciplines.  
 CO2 Apply Microsoft Visio in order to create technical drawings for the chemical engineering equipment and related disciplines.  
 CO3 Apply AutoCAD in order to create technical drawings for the chemical engineering equipment and related disciplines.

DRK1113  
 Material & Energy Balance  
 Credit: 3

#### Synopsis

This course is designed to give students a foundation in the basics of chemical engineering. Students will learn basic chemical engineering principles such as different unit systems, unit conversion, and the determination of process variables. The learned knowledge is then applied for material and energy balances for single or multiple unit operations of non-reactive and reactive chemical processes.

#### Course Outcomes

CO1 Solve the basic chemical engineering calculations involving conversion of units, determination of process variables and single-phase system.  
 CO2 Solve material balance of processes in nonreactive and reactive system in single and multiple units  
 CO3 Solve energy balance of processes in nonreactive and reactive system

DRK2223  
 Transport Processes  
 Credit: 2

#### Synopsis

This course is about heat and mass transfer. In the 'heat transfer', the student will learn about the principles of the heat transfer in steady state through conduction, convection and radiation. Meanwhile in the 'mass transfer', the principles of the mass transfer in gases, liquids, biological solutions and gel and solids will be discussed.

#### Course Outcomes

CO1 Explain the fundamental concepts of heat and mass transfer.  
 CO2 Apply the fundamental concept of heat and mass transfer mechanism to solve the problems  
 CO3 Analyse problems occur in unit operation equipment by using the fundamental concept of heat and mass transfer

DRK2421  
 Mass and Heat Transfer Lab  
 Credit: 1

#### Synopsis

This laboratory course is offered to enhance student's understanding through experiments to observe the application of theories learned in Mass Transfer and Heat Transfer. Numbers of experiments have been designed such as shell and tube heat exchanger, plate heat exchanger, tray dryer, mass transfer coefficient apparatus, fixed and fluidized bed apparatus. In this lab, students will be given a main objective of each experiment and the instructor will explain about the work Instruction to run the experiment. Then, by working in their group, students will run the experiment under supervision of the instructor. This will encourage students to be more creative and inculcate critical thinking among the group members. Besides that, students will be exposed to the industrial environment and safety precautions.

#### Course Outcomes

CO1 Apply fundamental theories of chemical unit operation  
 CO2 Operate common unit operation equipment which use in industries and be familiar to their components and function  
 CO3 Ability to communicate effectively and presenting the data

DRK1341  
 Analytical Instrumental Lab  
 Credit: 1

#### Synopsis

In the Analytical Instrument Lab, students

conduct an experiment which involves different types of analytical equipment. Students are given the main objective of each experiment and the instructor will explain about the standard operating procedure to run the experiment. Then, by working in their group, students will conduct the experiment under supervision of the instructor. Students are encouraged to be creative and inculcate critical thinking among the group members during the lab session. In overall, this lab consists of seven experiments which involves seven analytical equipment; Melting Point Apparatus, UV-Visible Absorption Spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR), Refractometer, pH meter and Conductivity Meter and Thermogravimetric Analyzer (TGA).

#### Course Outcomes

CO1 Demonstrate theories applied in analytical chemistry theories in the corresponding experimental works.

CO2 Apply all the analytical chemistry knowledge in solving problems and interpretation of experimental data

CO3 Adapt the team working behaviour and commitment as a member while working on the group assignment.

DRK1213  
Thermodynamics  
Credit: 3

#### Synopsis

This course covered the properties of pure substances, the first law of thermodynamics for the closed and open systems, the second law of thermodynamics, entropy and introduction to the refrigeration, heat engine and heat pump.

#### Course Outcomes

CO1 Apply and solve the energy balance of a process by the First Law of Thermodynamics.

CO2 Apply and solve the problems related to the Second Law of Thermodynamics on ideal and irreversible processes.

CO3 Apply and solve the problems related to the refrigerator, heat engine and heat pump.

DRK2243  
Chemical Reaction Engineering  
Credit: 3

#### Synopsis

In chemical reaction engineering, the student will learn the basic concept, design and calculation of various types of reactor in chemical processes such as batch reactor, CSTR, and PFR. The topics covered in this subject are mole balances, conversion, reactor sizing, rate law, isothermal and non-isothermal reactor design, multiple reaction and catalyst.

#### Course Outcomes

CO1 Explain the fundamentals of chemical reaction engineering such as mole balance, rate law, and stoichiometry using concepts in reactor design.

CO2 Apply the concepts for the reactor operations using analytical skill.

CO3 Solve problems related to reactor operation.

DRK1123  
Engineering Mechanics  
Credit: 3

#### Synopsis

This subject will introduce students with concept of statics and dynamics and its application in related engineering field. The topics covered in this subject are static of particle, static of rigid body, distributed forces, analysis of structure, friction, kinematics and kinetics of particles. By completing the course, students will comprehend the basic mechanisms and applications of statics and dynamics in related engineering field.

#### Course Outcomes

CO1 Apply the basic concepts in statics to solve problems concerning resultant of forces acting on a particle and equilibrium of a particle

CO2 Analyse problems involving the equilibrium of a rigid body and use the fundamental principles in statics to solve them  
Apply the fundamental concept of heat and mass transfer mechanism to solve the problems

CO3 Solve problems involving the kinematics and kinetics of a particle by applying the basic principles in dynamics

DRK2431  
Chemical Reaction Laboratory  
Credit: 1

#### Synopsis

In the Chemical Reaction Laboratory, students are required to perform laboratory work in investigating the effect of pressure, mixing, temperature and different acid types on solid liquid reaction and also to determine the heat of reaction in the chemical reaction process. Continuous Stirred Tank Reactor (CSTR), Tubular Flow Reactor (TFR), Plug Flow Reactor (PFR) and batch reactor will be used in this experiment in order to expose students to the industrial environment.

#### Course Outcomes

CO1 Apply the engineering and chemical reaction concept to solve lab experiment problems.  
CO2 Operate and demonstrate different type of reactors with different reactions  
CO3 Able to work in a group and commit with the date line.  
CO4 Commit with all the lab rules and regulations

DRK2352  
Plant Supervision  
Credit: 2

#### Synopsis

This course will cover the foundation of supervision, planning & organizing skills, staffing skills and controlling skills. Besides that, it will also expose the students to the real conditions and functions of the supervisor and the supervisory concept-applied in the working culture.

#### Course Outcomes

CO1 State the foundation for effective supervision  
CO2 Define the key concepts of planning, organizing, staffing and controlling.

CO3 Describe the methods for stimulating individual and group performance.  
CO4 Describe the process for coping with the workplace.

DRK2233  
Environmental Engineering  
Credit: 3

#### Synopsis

This subject is designed to introduce to the students the principles, scientific assessment and engineering solutions to environmental problems affecting water, air and solid. Topics include environmental concerns, legislation and regulation practices, wastewater quality management, wastewater treatment, outdoor air pollution, solid and hazardous waste disposal. It also includes the equipment selection and problem-solving technique to prevent the pollution through different processes and technologies.

#### Course Outcomes

CO1 Discuss compliance to environmental legislation & regulation practices in Malaysia.  
CO2 Analyse and solve problems involving water and wastewater treatment.  
CO3 Determine the concept involved in management of solid waste, hazardous waste and air pollution control Solve calculation problem related to Safety, Health and Environment

DRK2133  
Fluid Mechanics  
Credit: 3

#### Synopsis

This course is an introduction to fluid mechanics, and emphasizes fundamental concepts and problem-solving techniques. Topics to be covered include fluid properties, fluid statics, fluid dynamics, control volume analysis and pipeline system.

#### Course Outcomes

CO1 State the foundation for effective supervision  
CO2 Define the key concepts of planning,

organizing, staffing and controlling.  
 CO3 Describe the methods for stimulating individual and group performance.  
 CO4 Describe the process for coping with the workplace.

DRK2362  
 Plant Commissioning, Start-Up & Shut-Down  
 Credit: 2

#### Synopsis

The understanding of engineering practices in plant commissioning and start-up are essential for the practicing technicians. This class will provide the student with a thorough understanding of the fundamentals in commissioning and start-up of chemical plants from the view point and experience of industrialists. It will cover subjects such as plant inspection, instrument testing, leak testing, pressure testing, plant monitoring, commissioning hazards, permit to work and plant maintenance and shutdowns.

#### Course Outcomes

CO1 Describe the stages and phases involved in plant commissioning, start-up and shut-down.  
 CO2 Explain the activities implemented during plant commissioning, start-up and shut-down.  
 CO3 Apply the best engineering practices in each activity in the process and operation of plant commissioning, start-up and shut-down.  
 CO4 Analyse safety and health issues and the action taken that need to be consider for any potential hazardous situation that may occur during plant commissioning, start-up and shut-down

DRK2372  
 Plant Safety & Health  
 Credit: 3

#### Synopsis

This subject is primarily to expose students with the concepts, practical aspects and applications of safety and health (SH) and some basic of environmental concern in the chemical industries. The students will be taught the day-to-day and management

aspects of SHE which includes local and international regulations such as OSHA, CIMA, EQA and other related acts will be covered. Simple common case studies would be exemplified from local and abroad.

#### Course Outcomes

CO1 Explain the importance of Safety, Health and Environment (SHE) in chemical industries  
 CO2 Understand common international and local regulations regarding Safety, Health and Environment  
 CO3 Solve calculation problem related to Safety, Health and Environment

DRK2382  
 Plant Utility  
 Credit: 2

#### Synopsis

This course is designed to introduce the basic utilities system employed in the chemical related plants such as boiler, cooling tower, compressors, water and flare systems. In each module, the students will be introduced to the basic concept of theory, operations, industrial applications, and maintenance procedure and equipment safety. At the end of this course, students are expected to be able to elaborate, theorize and identify the utilities systems that are commonly employed in chemical industries.

#### Course Outcomes

CO1 Explain the basic mechanisms, principles and applications of boiler, steam distribution and pump.  
 CO2 Explain the basic mechanisms, principles and applications of valve, cooling tower, compressor, water and flare systems  
 CO3 Demonstrate understanding of current engineering problems and good communication skills through case study presentation and analysis

DRK2393  
 Process Instrumentation & Control  
 Credit: 3

#### Synopsis

This is an introductory level course about process control and instrumentation systems used in chemical industries. The topics that will be included in this subject are fundamentals and concepts of process control and instrumentation systems, working principle of various control system instruments like transmitters, control valves, various measuring instruments for flow, level, temperature, pressure and composition, data communication in computer process control, distributed control system (DCS) and alarm systems using both theory and practical methods.

#### Course Outcomes

CO1 Understand the basics of process control and instrumentation systems, process and instrumentation diagram (P&ID) used in chemical industries.

CO2 Describe the working principle of transmitters, control valves and various process measuring instruments.

CO3 Operate the process measuring instruments used in chemical processes.

CO4 Perform the control of various chemical processes using virtual simulator

CO5 Demonstrate feedback controllers, alarm, data acquisition functions and process history view in a control system

DRK2254

Unit Operations

Credit: 4

#### Synopsis

This class will provide the student with a thorough understanding of the fundamentals in unit operations involved in chemical engineering process and industry including evaporation, drying, absorption, distillation and leaching. At the end of this course, students are expected to understand the basic mechanisms, principles, basic design parameters and applications of the selected unit operations and are able to solve chemical engineering problems related to them. To enhance operational knowledge in unit operations, the students will be exposed to the related experiments such as evaporation, absorption, and distillation.

#### Course Outcomes

CO1 Explain and describe the basic mechanisms, principles and applications of distillation, absorption, evaporation, drying, leaching and extraction.

CO2 Determine basic design parameters associated with the unit operations.

CO3 Solve calculations related to the unit operations.

CO4 Apply the knowledge of unit operation in the laboratory.

DRK3610

Industrial Training

Credit: 10

#### Synopsis

In industrial training, the students should gain insight into the industrial practice, in order to visualize the tasks and possibilities of their later occupation work. All students are required to undergo 24 weeks of industrial training during the start of the semester of the third academic year. The performance of each student during the periods of his/her Industrial training is evaluated jointly by the faculty staff, and the representatives from employer organizations. The student is required to maintain proper records and submit reports on the training received by him/her. The industrial training report should cover all periods of approved training time. The report document is expected to demonstrate development of practical and professional skills in Engineering through technical experience and application of theoretical knowledge. Development of skills in dealing with people, and communication skills are part of the subject objectives. The student should be able to present the report to the university supervisor, as a complement to their diploma.

#### Course Outcomes

CO1 Display independency in actual working environment with minimal supervision

CO2 Display communication skill with different levels of staff in the organization

CO3 Present technical documents related to the work completed

CO4 Practice positive attitude during the training





# FACULTY OF CIVIL ENGINEERING TECHNOLOGY

COURSE INFORMATION 2022-2023

## CURRICULUM STRUCTURE BACHELOR OF CIVIL ENGINEERING TECHNOLOGY (BUILDING) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
COURSES	Fundamentals of English Language UHL2400	UHL2422 English For Technical Communication	BUM2123 Applied Calculus	UHL2432 English For Professional Communication	UHF2**1 Foreign Language Level 2	UGE2002 Technopreneurship	BCA4054 Industrial Based Final Year Project 1	BCA4066 Industrial Based Final Year Project 2
	Falsafah dan Isu Semasa UHC1012	UHC2022 Penghayatan Etika dan Peradaban	BCA2133 Structural Analysis	UHF1**1 Foreign Language Level 1	BCA3943 Construction Method Technology	BCA3334 Construction Management & Estimation Technology	BCA4042 Industrial Based Technologist and Society	BCA4012 Industrial Training Attachment
	Co-Curriculum UQA2002	UHS1022 Soft Skills	BCA2413 Fluid Mechanics	BCA2934 Reinforced Concrete Design Technology	BCB3033 Occupational Safety Health for Building Construction	BCB3153 Steel and Timber Design Technology	BCA4244 Industrial Based Building Assessment and Reporting	
	English For Academic Communication UHL2412	BUM2413 Applied Statistics	BCA2312 Information System In Civil Engineering	BCA2423 Hydraulics & Hydrology	BCB3223 Building Services Technology	BCB38*3 Elective 2		
	Technical Mathematics BUM1113	BCA1914 Built Environment Technology	BCA2924 Geotechnical & Site Investigation Technology	BCA2523 Highway & Transportation Technology	BCA3324 Building Information Modelling	BCB38*3 Elective 3		
	Basic Physics BUF1113	BCA1122 Mechanics of Materials	BCA2721 Geotechnical Testing Lab	BCA2731 Highway & Transportation Lab	BCA3433 Urban Stormwater Technology	BCB3964 Capstone Project for Technologist		
	Geomatic Technology BCA1513	BCA1212 Construction Materials Technology		BCA2613 Environmental Engineering Technology	BCB38*3 Elective 1			
	Engineering Mechanic BCA1112	BCA1711 Structural & Construction Materials Lab		BCB2143 Industrialised Building System				
	Introduction to Civil Engineering & Technologist BCA1023							
	Civil Engineering Drawing BCA1023							
<b>TOTAL CREDIT</b>	<b>20</b>	<b>18</b>	<b>16</b>	<b>20</b>	<b>20</b>	<b>19</b>	<b>10</b>	<b>18</b>
<b>TOTAL CREDIT FOR GRADUATION</b>	<b>141</b>							



**ELECTIVE COURSES FOR  
BACHELOR OF CIVIL ENGINEERING TECHNOLOGY (BUILDING) WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BCB38*3	Elective 1 Building Facilities & Maintenance (compulsory)	3
2	BCB38*3	Elective 2 Building Forensic	3
3	BCB38*3	Elective 3 Building Demolition	3
4	BCB38*3	Elective 4 Green Building	3
<b>TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION</b>			<b>9</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Apply fundamental knowledge to solve broad civil engineering problems with current technologies techniques.
PEO2	Supervise and monitor people within various background.
PEO3	Accommodate to changes in civil engineering technology and environment.

**PROGRAMME OUTCOMES (PO)**

At the end of the programme, graduates should be able to (adapted from the MBOT):	
PO1	Apply the knowledge of technology fundamentals to broadly defined procedures processes, systems and methodologies in the civil engineering technology.
PO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems.
PO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in civil engineering technology.
PO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	Demonstrate an awareness of management and technopreneurship practices in real perspective.
PO8	Demonstrate professionalism and social and ethical consideration.
PO9	Demonstrate leadership quality, mentoring and work effectively in diverse teams.

## COURSE SYNOPSIS

### COURSE STRUCTURE FOR BACHELOR OF CIVIL ENGINEERING TECHNOLOGY (BUILDING) WITH HONOURS

UHC1012

Falsafah dan Isu Semasa

Credit: 2

Prerequisites: None

#### Synopsis

Kursus merangkumi hubungan ilmu falsafah dengan Falsafah Pendidikan Kebangsaan dan Rukunegara. Penggunaan falsafah sebagai alat untuk memurnikan budaya pemikiran dalam kehidupan melalui seni dan kaedah berfikir serta konsep insan. Topik utama dalam falsafah iaitu epistemologi, metafizik dan etika dibincangkan dalam konteks isu semasa. Penekanan diberi kepada falsafah sebagai asas bagi menjalin dialog antara budaya serta memupuk nilai sepunya. Di hujung kursus ini pelajar akan mampu melihat disiplin-disiplin ilmu sebagai satu badan ilmu yang komprehensif dan terkait antara satu sama lain.

#### Course Outcome

CO 1 Menjelaskan isu semasa berlandaskan Ilmu Falsafah, Falsafah Pendidikan Kebangsaan & Rukun Negara

CO 2 Menghuraikan isu semasa berlandaskan aliran pemikiran utama dalam pelbagai aliran falsafah

CO 3 Menganalisis isu semasa melalui perspektif perbandingan falsafah sebagai asas bagi menjalinkan dialog antara budaya

UHL2412

English For Academic Communication

Credit: 2

Prerequisites: UHL2400

#### Synopsis

The course aims to equip students with the four language skills (i.e listening, reading, speaking and writing) and study skills for academic success. The course requires students to read various texts of general topics by incorporating essential reading

skills. Study skills such as note-taking and notemaking techniques, and active listening skills are also emphasised. Students will be exposed to thesis-support essays and writing styles and organisation appropriate for their level. Additionally, students will be exposed to presentation skills and e-learning platform will also be introduced as part of the course.

#### Course Outcome

CO 1 Apply reading skills to extract and transfer specific information from general texts.

CO 2 Evaluate important information from different sources.

CO 3 Apply appropriate and accurate language in written and/or spoken discourse.

CO 4 Demonstrate effective presentation skills using appropriate non-verbal cues.

BUM1113

Technical Mathematics

Credit: 3

Prerequisites: None

#### Synopsis

This course discusses in depth of functions and differentiation. Topics cover under this course are: The Concepts of Limit, Computation of Limit, Continuity and Its Consequence, Limit Involving Infinity, The Derivative, Computation of Derivative, The Product and Quotient Rule, The Chain Rule, Higher Derivatives, Implicit Differentiation, Rates of Change and Related Rates, Maximum and Minimum Values, Mean Value Theorem, Concavity and Second Derivatives Test, Overview of Curve Sketching, Optimization Problems, Antiderivatives, Indefinite Integral, Definite Integral, Integration by Substitution, Integration by Parts, Integration of Rational Function using Partial Fractions, Area Between Curves. Arc Length and Surface Area, Volume: Slicing Method, Volume: Disks Method, Volume by Cylindrical Shells

#### Course Outcome

CO 1 Acquire fundamental principle of differentiation.

CO 2 Apply appropriate calculus concepts to

solve various technological problems.  
CO 3 Use appropriate software and tool to solve the graphical and computational problems in calculus

BUF1113  
Basic Physics  
Credit: 3  
Prerequisites: None

#### Synopsis

This course is intended to expose the central ideas and principles of physics to students requiring a general background in physics. It covers unit and measurements, kinematics, forces and Newton's law of motion, statics equilibrium, work, energy and power, fluid mechanics, electricity and magnetism.

#### Course Outcome

CO 1 Explain solution of any related problems using the right principles and laws.  
CO 2 Analyze Physics concepts and theories learned to solve problems covered in the syllabus in terms of physical principles and concepts.

BCA1513  
Geomatic Technology  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This subject will expose to the students the role of survey engineering in their field. The subject topics encompasses introduction to the engineering surveying, surveying equipment, measurement unit, bearing/angle and distance measurement for horizontal control, vertical distance measurement, coordinate system, and the final setting out for construction work.

#### Course Learning Outcomes (CLO):

CLO1 Apply the range of calculations that can be made with surveying data i.e. An ability to make a necessary calculation to fix position of forming the point of building in construction work project.  
CLO2 Conduct the fieldwork to perform

horizontal and vertical control based on related provision by using equipments/modern tools.

CLO3 Benchmark the group results obtained using comparative tabulation method

BCA1112  
Engineering Mechanics  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This course is the fundamental of most engineering courses that introduces the concept of statics with the study of particles and rigid bodies at rest or move with constant velocity which are in equilibrium. This course was designed to provide knowledge for students to analyze stress, designing of machines, structures and hydraulics. It consists of fundamental concept of mechanics, force vectors, force system resultants, condition of equilibrium, center of gravity and moment of inertia. At the end of the course, students are expected to be able to solve problems in mechanics through numerous free body diagram problems.

#### Course Learning Outcomes (CLO):

CLO1 Describe the fundamental concept of static in the mechanical system for engineering application.  
CLO2 Solve the rigid bodies problem by using static equilibrium equation.  
CLO3 Determine the centroid and moment of inertia of the composite bodies.

BCA1010  
Seminar: Introduction to Civil Engineering & Technologist (HW)  
Credit Hour: 0  
Prerequisite: None

#### Synopsis

This course is designed as a compulsory attending course, which is carried out based on a seminar format. Speakers from the practicing civil engineering-based organisations will be invited to talk on the main discipline in civil engineering field and roles and career path as civil engineering technologist. At the same time to expose

students to the basic laws regulated by professional bodies i.e Malaysia Board of Technologist.

#### Course Learning Outcomes (CLO):

CLO1 Able to discuss the functions for each of civil engineering branches and challenges as future technologist.

CLO2 Able to respond the issues and challenges in adhere to professional ethics.

BCA1023

Civil Engineering Drawing

Credit Hour: 3

Prerequisite: None

#### Synopsis

This subject aims to introduce civil engineering students to the basic technical and engineering drawing. The fundamental skills namely geometry, projection orthography, isometric and create typical drawings using Computer Aided Drawing (CAD) tools will be applied in the hands-on session. The students will also be expose to read and interpret civil and structural engineering drawings. At the end of the course, students are able to produce civil engineering drawing using CAD.

#### Course Learning Outcomes (CLO):

CLO1 Interpret the actual construction civil engineering drawings

CLO2 Execute computer-aided software to produce engineering drawing

CLO3 Demonstrate the ability to lead and productively participate in group situations

UHL2422

English For Technical Communication

Credit: 2

Prerequisites: UHL2312, UHL2412

#### Synopsis

The course is designed for technical communication relevant to academic and professional purposes. It provides opportunities for students to learn and employ language skills and strategies appropriate to written and spoken technical communication

for professional audiences. In the course, students are required to listen to, evaluate, organize, present and write technical information. The contents of this course consist of, but not limited to, technical descriptions, technical processes and procedures feasibility and recommendation reports. Additionally, students have the advantage to collaborate in teams while performing activities assigned to them. Students are encouraged to benefit in language learning when they engage in self-access activities.

#### Course Outcome

CO 1 Determine salient information from listening tasks related to technical communication

CO 2 Transfer salient information from technical reading materials and documents into appropriate format.

(Content)

CO 3 Demonstrate presentation skills using appropriate delivery strategies. (Delivery)

CO 4 Apply appropriate and accurate language in written and/or spoken discourse. (Language)

UHC2022

Penghayatan Etika dan Peradaban

Credit: 2

Prerequisites: None

#### Synopsis

Kursus ini menjelaskan tentang konsep etika daripada perspektif peradaban yang berbeza. Ia bertujuan bagi mengenal pasti sistem, tahap perkembangan, kemajuan dan kebudayaan merentas bangsa dalam mengukuhkan kesepaduan sosial. Selain itu, perbincangan dan perbahasan berkaitan isu-isu kontemporari dalam aspek ekonomi, politik, sosial, budaya dan alam sekitar daripada perspektif etika dan peradaban dapat melahirkan pelajar yang bermoral dan profesional. Penerapan amalan pendidikan berimpak tinggi (HIEPs) yang bersesuaian digunakan dalam penyampaian kursus ini. Di hujung kursus ini pelajar akan dapat menghubungkan etika dan kewarganegaraan berminda sivik.

#### Course Outcome

CO 1 Menjelaskan konsep etika dari peradaban yang berbeza.

CO 2 Membandingkan sistem, tahap perkembangan, kemajuan sosial dan kebudayaan merentas bangsa.

CO 3 Membincangkan isu kontemporari berkaitan ekonomi, politik, sosial, budaya dan alam sekitar.daripada perspektif etika dan peradaban.

UHS1022

Soft Skills

Credit: 2

Prerequisites: None

### Synopsis

This course exposes students to Soft Skills which are non-job specific skills that are important in personality development. This course aims to develop holistic students with sense of awareness, good manners and responsible in self-management, social relationships with others and society and also the environment. It focuses on spiritual, emotional, leadership and team working, lifelong learning, integrity, manners and positive values, critical thinking and problem solving using an integrated approach in developing balance, well-mannered and well-rounded personalities as a leader. In the end, students will be more spiritually, emotionally, intellectually and socially resilient to face any challenges in their life.

### Course Outcome

CO 1 Recognize positive values as a leader

CO 2 Organize diversified information to solve problem sustainably as a leader

CO 3 Perform effective leadership attributes

BUM2413

Applied Statistics

Credit: 3

Prerequisites: None

### Synopsis

This course discusses on statistical problem-solving methodology and descriptive statistics; sampling distribution and confidence interval;

hypothesis testing; analysis of variance (ANOVA); goodness-of fit test and contingency tables; regression and correlation including simple and multiple linear regressions. Microsoft Excel software will be used in this course as a statistical package (other statistical packages are SPSS, R Language, S Plus, EViews and Minitab shall be used in this course).

### Course Outcome

CO 1 Acquire fundamental principle of statistics

CO 2 Perform statistical analysis by using appropriate statistical theory and methodology

CO 3 Analyse real life data to solve related problems in various disciplines

BCA1914

Built Environment Technology (Project Based Learning 1)

Credit Hour: 4

Prerequisite: None

### Synopsis

This course aims to provide fundamental understanding of how a success of a built environment is significantly depending on its relationship to its site and surroundings. It introduces the key principles of conducting site analysis, site response and site approach up to the development of conceptual drawing through exploration of geographical, climatic and infrastructural contexts of the site as well as historical and legal considerations. In addition, the course will emphasise the concept of sustainability and universal design in encouraging social responsibilities towards planning, designing and constructing the built environment.

### Course Learning Outcomes (CLO):

CLO1 Identify fundamentals principles of site analysis, site response and site approach of built environment development

CLO2 Determine appropriate legal consideration for particular built environment site

CLO3 Establish solutions that are suitable with different contextual conditions

CLO4 Develop conceptual drawing that addresses the site surroundings, legal

consideration and social responsibilities

BCA1122

Mechanic of Materials

Credit Hour: 2

Prerequisite: BCA1112 Engineering Mechanics

Synopsis

The aims of this course are to study of the behavior of engineering or structural elements subjected to loads. It provides an introduction on elastic stress and strain analysis, axial deformations, transformation of stress, torsional, analysis of beam and analysis of column. The objective is to equip the students with the basic understanding of force equilibrium, stresses and strains of an elements/structures when it is subjected to external loads.

Course Learning Outcomes (CLO):

CLO1 Identify the concepts of stress and strain and their relationship with material properties for various structures.

CLO2 Determine the maximum shear and bending moment of the beam from shear force diagram and bending moment diagram within two decimal places

CLO3 Apply the concept of axially loaded bars, beams and columns within three decimal places.

BCA1212

Construction Materials Technology

Credit Hour: 2

Prerequisite: None

Synopsis

Construction Materials Technology is a compulsory course that introduces students to the commonly construction materials and construction technologies used for building works. Students will explore the characteristics and performance of each material and their application in the building construction. At the end of the course, students are expected to be able to provide a suitable construction materials and technologies for building works with emphasis on sustainability aspect.

Course Learning Outcomes (CLO):

CLO1 Describe the suitable construction materials used for building works.

CLO2 Describe the suitable construction technologies used for building works.

CLO3 Adopt the sustainability for building construction.

BCA1711

Structural & Construction Materials Lab

Credit Hour: 1

Prerequisite: None

Synopsis

Construction This laboratory is a compulsory course for students to investigate the properties of construction material such as sand, aggregate, concrete and steel reinforcement. Students will get hands-on experienced through the various experiments. At the end of the course, students are expected to be able to provide skill to conduct testing for the selected construction materials.

Course Learning Outcomes (CLO):

CLO1 Perform the laboratory test for selected construction materials according to the standard requirement.

CLO2 Effectively producing report according to the collect, analyse and interpret experimental data within the time given.

BUM2123

Applied Calculus

Credit: 3

Prerequisites: None

Synopsis

This course introduces Polar Coordinates and Vector, Vector-Valued Functions, Partial Derivatives, and Multiple Integrals. Appropriate software is used by students to implement some of these ideas in practice.

Course Outcome

CO 1 Acquire fundamental calculus concepts of equations and vectors

CO 2 Analyse and solve wide range of

problems in science and engineering by using concept of calculus  
 BCA2133  
 Structure Analysis  
 Credit Hour: 3  
 Prerequisite: BCA1122 Mechanic of Materials

#### Synopsis

This course is designed to expose students to the analysis of statically determinate and indeterminate structures in civil engineering. It covers major structural types of beams, trusses and frames structures subjected to various load conditions using classical methods. The course aims on fundamental concepts of determining the structural stability and determinacy. As for slope and deflection of beams, the use of Macaulay and unit load method are covered. The course emphasizes on analysis of trusses by using method of joint and unit load method. The effects of moving load on determinate beam and truss under the topic of influence line is also included. Besides that, analysis by moment distribution method for indeterminate beams and frames are examined. At the end of the course, students should be able to apply the knowledge and use the techniques for analyzing determinate and indeterminate structural elements.

#### Course Learning Outcomes (CLO):

CLO1 Identify the fundamental concepts of stability, determinacy and fundamental of analysis using various method for statically determinate and indeterminate structures.  
 CLO2 Determine the slope and deflection for beam and internal forces and deflection for truss by using different methods for static loads as well as influence lines due to moving loads for beam and truss  
 CLO3 Determine the end moments by using moment distribution method for statically indeterminate beams and frames as well as shear-moment diagrams

BCA2413  
 Fluid Mechanics  
 Credit Hour: 3  
 Prerequisite: None

#### Synopsis

To introduce the fundamental principles of fluid mechanics, the basic equations governing fluid statics and fluid flow, and the methods of solving engineering problems related to fluid mechanics.

#### Course Learning Outcomes (CLO):

CLO1 Estimate the fluid properties problem using the fundamentals of Fluid Mechanics concept related to Newton's laws, Hydrostatic Law & Bernoulli equation.  
 CLO2 Apply the Bernoulli's Principles & Continuity Law in water distribution system.  
 CLO3 Demonstrate laboratory works by using manual based on Newton Laws, Hydrostatic Law, Bernoulli equation and Continuity Law.

BCA2924  
 Geotechnical & Site Investigation Technology (Project Based Learning 2)  
 Credit Hour: 4  
 Prerequisite: Taken BAA1914 (PrBL 2)

#### Synopsis

This course will expose students with the procedure, applicability and limitations of various methods of geotechnical investigation as well as the field tests to be conducted. The course aims to equip students with some confidence in effectively managing and executing geotechnical investigation programs in real field. As a result of this, ability of the students in making proper engineering judgments and in taking appropriate decisions related to geotechnical investigations will be greatly improved.

#### Course Learning Outcomes (CLO):

CLO1 Respond to the geotechnical situations and problems according to various methods of geotechnical investigation and field tests.  
 CLO2 Establish a clear idea about how a geotechnical investigation program is to be planned and executed  
 CLO3 Justify the reasons to take proper engineering decisions and the best approach in problem solving in real situations.  
 CLO4 Propose site investigation procedure according to the recognized standard

**BCA2721**

Geotechnical Testing Lab

Credit Hour: 1

Prerequisite: None

**Synopsis**

This course includes practice modules and demonstrations covering Geotechnical testing and investigations. Practice requirements for each module include laboratory work in a team environment, site visits and the preparation of individual reports. The site visits prepares the student with some basic in-situ activity. Data collection and analysis is the main focus in this course. Students will be required to carry out soil tests according to guidelines to obtain various engineering parameters in Geotechnical Engineering.

**Course Learning Outcomes (CLO):**

CLO1 Discover basic properties and characteristics of samples according to the standard operating procedure outlined in the laboratory to resolve related situations and problems.

CLO2 Propose suitable solutions to identified problems comprises of all the information gathered during the investigation and tests data using guidelines and requirements

**BCA2312**

Information System in Civil Engineering

Credit Hour: 2

Prerequisite: None

**Synopsis**

This course is designed to expose students in using and managing big data in the construction industry in a structured manner. Introduction the concept of Knowledge Management and Data Flow Diagram, and the usage of Database Management System (DBMS) as an application tool allow students to apply IT applications in solving construction related problems. This course also exposes students on how to ensure that huge set of data is manipulated and used effectively. At the end of the course, students should be able to use and manage DBMS related to the construction industry.

**Course Learning Outcomes (CLO):**

CLO1 Apply system analysis concept, information management and basic knowledge management

CLO2 Manage the work of process related to construction related problems by using Data Flow Diagram and the related programs

**UHL2432**

English For Professional Communication

Credit: 2

Prerequisites: UHL2322, UHL2422

**Synopsis**

The course is designed to develop students' spoken and written communication skills effectively. This is vital in helping them to enter the job market and preparing them for workplace. Students will enhance their language skills via learning activities that incorporate communication strategies, interactions and feedback. The learning activities include, but not limited to, carrying out presentations, attending mock-job interviews and conducting meetings.

**Course Outcome**

CO 1 Apply appropriate and accurate language in written and /or spoken communication

CO 2 Deliver relevant information in written and / or spoken communication

CO 3 A Demonstrate effective delivery skills in presenting information

**BCA2934**

Reinforced Concrete Design Technology (Project Based Learning 3)

Credit Hour: 4

Prerequisite: Taken BCA2133 Structural Analysis

**Synopsis**

This course covers the analysis and design reinforced concrete structures to EC2 for beams, slab, column and foundation. At the end of the course, students are expected to be able to analyse reinforced concrete structure and produce the report of multi-storey building.



Course Learning Outcomes (CLO):

CLO1 Analyze reinforced concrete beam, slabs, column and foundation.

CLO2 Adopt relevant codes of practice in designing reinforced concrete building structures.

CLO3 Produce manual design report of a multi storey reinforced concrete building design project .

CLO4 Conduct appropriate design software in producing structural drawing and design of a multi storey reinforced concrete building design project

BCA2423

Hydraulic & Hydrology

Credit Hour: 3

Prerequisite: BCA2413 Fluid Mechanic

Synopsis

This course introduces the concept and use of equations for open drainage and flow analyses (uniform & non-uniform flow) in open channel. It also covers the various phenomena such as hydraulic jump and backwater, specific energy and specific force concept application, determine the hydraulics machinery principles and dimensional analysis & hydraulic similarity concepts. This course also introduce the hydrology theory derived from the natural process of hydrological cycle and reservoir management. The implementation of hydraulics and hydrological principles are embedded in laboratory activities.

Course Learning Outcomes (CLO):

CLO1 Adopt hydraulics total energy principles for the estimation of the flow capacity in open channel to ensure efficient water conveying system in the regions

CLO2 Classify the hydrological components to obtain the hydrological parameters using various statistical analyses for the determination of peak flow discharge to ensure sustainable water resources for the communities

CLO3 Conduct lab works for the determination of the hydraulic and hydrological parameters to estimate flow capacity

BCA2523

Highway & Transportation Technology

Credit Hour: 3

Prerequisite: None

Synopsis

This course will exposed students with sound knowledge and understanding of Highway & Transportation Technology with an emphasis on the design standards that being used in Malaysia. Topic covers are transportation planning process, traffic engineering studies which includes fundamentals principles of speed and volume studies, road Capacity, road geometric design, pavement materials, pavement design and pavement maintenance and rehabilitation.

Course Learning Outcomes (CLO):

CLO1 Describe the importance of highway and transportation planning and engineering in urban and rural applications

CLO2 Implement transport technology to provide sustainable highway and transportation system

CLO3 Illustrate latest technology towards the provisions of sustainable transportation constructions and system

BCA2731

Highway & Transportation Lab

Credit Hour: 1

Prerequisite: None

Synopsis

This course involves practice modules covering aspects of Highway & Transportations. Practice requirements include laboratory work in a team environment, site study and the preparation of reports. The site study provides the student with real case situation of traffic & transportation system. Students also will be exposed to carry out highway materials tests according to Malaysian Standards in order to gauge various engineering properties of highway materials. The experiments are complementary to the theories that students have learned in the classroom and also to expose them to the practical work at the

construction industry.

Course Learning Outcomes (CLO):

CLO1 Conduct data collection exercise for existing highway and transportation facilities  
CLO2 Liase with learned society to shortlist existing and potentials transportation issues and problems

BCA2613

Environmental Engineering Technology

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the development in environmental technology. This course will focus on the water and wastewater characteristics, water and wastewater treatment technologies, environmental pollution issues, introduction of application-related technology to address the problems of global pollution as well as environmental laws and policies aspects. In addition, some basic analyses of water and wastewater charactersitics will be introduced through laboratory work.

Course Learning Outcomes (CLO):

CLO1 Demonstrate the water and wastewater characteristics using Standard Methods for the Examination of Water and Wastewater.

CLO2 Explain the water and wastewater treatment technology pertaining to drinking water, effluent wastewater standard and environmental pollution issues with related to National Water Quality Standards and Environmental Quality Act 1974.

CLO3 Illustrate the waste management issues based on the regulations stipulated in the Environmental Quality Act, 1974 and Solid Waste And Public Cleansing Management 2007, (Act 672)

BCB2143

Industrialised Building System (IBS)

Credit Hour: 3

Prerequisite: None

Synopsis

This course provides an introduction of the Industrialised Building System and its implementation in the construction industry. Students will also be exposed to its fundamental challenges and IBS index scores determination. This course also will highlight general guidelines on design concepts on precast concrete systems.

Course Learning Outcomes (CLO):

CLO1 Describe the basic concept and implementation of industrialised Building System in the construction industry.

CLO2 Express the concept of Modular Coordination in IBS, joint system and tolerance.

CLO3 Evaluate the Principle of Score Calculation and its submissions.

BCA3943

Construction Method Technology

Credit Hour: 3

Prerequisite: None

Synopsis

Construction Method Technology prepares student to be familiar in supervising construction project. The student should be equipped with knowledge on overall construction process of building, retaining wall, highway, bridge and industrialised building system. The student would be equipped with knowledge that enable them to solve problem related to building construction at site. The student should be able to assess the quality of workmanship.

Course Learning Outcomes (CLO):

CLO1 Adapt the safety application and method of statement in a building project.

CLO2 Outline the construction method of retaining wall, highway, bridge and industrialized building system

CLO3 Propose the application of sustainable construction and quality control in construction

BCA3324

Building Information Modelling (Project Based Learning 4)

Credit Hour: 3

Prerequisite: Taken PrBL 1 to PrBL3

### Synopsis

In this course, BIM Fundamental Modelling, the focus is given on developing technical competency to the author, manage and extracting structural design deliverables using 3D parametric tools. The course will guide the participants through a step-by-step project-based workflow to learn and implement BIM using a real project data. The course is therefore designed practically hands-on where the participants are required to model a digital office building. The targeted skillsets for development includes hands-on technical skill, BIM knowledge and pro-active problem solving for the local construction industry.

### Course Learning Outcomes (CLO):

CLO1 Use current tools and techniques for BIM.

CLO2 Explain BIM based process flow of technical modeling.

CLO3 Produce BIM related deliverables including drawings, material schedule, and schedule of accommodation.

CLO4 Examine problems associated with delivering BIM-based process flow

BCB3033

Occupational Safety Health For Building Construction

Credit Hour: 3

Prerequisite: None

### Synopsis

The course focuses on the important aspects of occupational safety and health in building construction. Students are introduced to the different types of hazardous situation and how to perform Hazard Identification, Risk Assessment and Risk Control (HIRARC) for Building Construction. Additionally, other safety hazards and measures related to construction activities on site are also emphasized in this course.

### Course Learning Outcomes (CLO):

CLO1 Analyze hazardous materials, substances and unsafe practices on construction jobsites

CLO2 Examine the level of risk and safety of construction jobsite compliance to the national safety regulation.

BCB3223

Building Services Technology

Credit Hour: 3

Prerequisite: None

### Synopsis

This course is to develop the student with principle of the building services systems, the technique of integration amongst the building services systems, the building and the structure. The course will also highlight the systems of special interest, the key issues, benefits and limitations and the local practice in the building services field. This course also enhance knowledge in buiding services. The Building services are the essential services provided in the buildings for improving functioning of the buildings in efficient manner for the desired use of the building. The module comprises of learning the electrical services, mechanical services such as air conditioning, lighting, ventilation, fire protection, acoustics and sound insulations, elevators, escalators, as well as civil engineering services such as water supply, sanitary services, etc. have become most essential services for residential, hospitals industrial, high rise, hotels, motels, monumental buildings. At the end of the lessons students be able to made an applications of services for different types building considering.

### Course Learning Outcomes (CLO):

CLO1 Analyse the principles of building services in selected building

CLO2 Perform of building services systems into the building

CLO3 Organise the building services technology in all kinds of applications

BCA3433

Urban Stormwater Technology

Credit Hour: 3

Prerequisite: BCA2423 Hydraulic & Hydrology

### Synopsis

This course is to provide students with the principles in applied methods towards urban stormwater problems. It covers application and analysis of urban stormwater facilities, sedimentation processes and erosion problems which will equip the students with the skills on techniques of urban stormwater analysis. Few examples and case studies from the MSMA 2nd Edition will be introduced as a guideline to assist and expose student in real world applications.

#### Course Learning Outcomes (CLO):

CLO1 Calculate the characteristics of urban stormwater facilities (roof property, on-site detention, rainwater harvesting, infiltration facilities and pavement) using MSMA2  
 CLO2 Develop the urban stormwater spreadsheets (detention pond, drains & swales) using MSMA2.  
 CLO3 Examine the erosion and sediment control issues at construction sites for the environmental sustainability

BCB38\*3

Elective - Building Facilities & Maintenance

Credit Hour: 3

Prerequisite: Taken BCA1914, BCA2924, BCA2934, BCA3324

#### Synopsis

The course aims to provide students the knowledge in facilities maintenance. Students need to integrate all knowledge for improving the property's condition and managing the facilities. Emphasis is given on facilities maintenance systems, safety maintenance, operation of maintenance. At the end of the course, students will complete a project related to maintaining building facilities and maintenance.

#### Course Learning Outcomes (CLO):

CLO1 Understanding components of building facilities and maintenance  
 CLO2 Outline the building facilities & maintenance of building  
 CLO3 Propose the application of building facilities maintenance functions

UGE2002

Technopreneurship

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course intends to provide an understanding of fundamentals of entrepreneurship. The topic includes assessing economic environment for new business ventures application of technology in entrepreneurship, regulations governing business entities in Malaysia, financial assistances and technical supports from various agencies business plan, marketing plan, business operational plan and financing plan. students will be exposed to various case successful entrepreneurs, locally and internationally

#### Course Learning Outcomes (CLO):

CLO1 Analyse the fundamental concept and definition of entrepreneurship as career of choice.  
 CLO2 Apply the basic knowledge to form legal business entity and seek supports and other technical services for agencies individual assignment.  
 CLO3 Produce a business plan for micro to medium size enterprise which integrates fundamental business principles, marketing, operation, finance and business management.

BCA3334

Construction Management & Estimation Technology (Project Based Learning 5)

Credit Hour: 4

Prerequisite: Taken PrBL 1 to PrBL 4

#### Synopsis

To

#### Course Learning Outcomes (CLO):

CLO1 Formulate schedules and costings for construction project using Network Diagram and SMM Method  
 CLO2 Defend the principles of construction management for project planning  
 CLO3 Revise Masterworks Programme

using MS Project for project planning and scheduling tasks

CLO4 Influence others to lead and productively participate in group activity

BCB3153

Steel & Timber Design Technology

Credit Hour: 3

Prerequisite: Taken BCA2133

### Synopsis

This course covers the analysis and design steel structures to EC3 for beams, column, connections, trusses, compression members and tension members. This course is also covered an introduction to Timber design to MS544. At the end of the course, students are expected to be able to analyse and design steel & timber structure and produce the report of structural steel multi-storey building.

### Course Learning Outcomes (CLO):

CLO1 Identify the steel and timber structural based on the specific code of practice

CLO2 Design basic steel structural elements such as beams, columns, trusses and connections according to the relevant codes of practice in building design

CLO3 Design the basic structural timber using tables and formula according to the relevant codes of practice in building design

CLO4 Produce the multi storey structural steel building designed report by writing and using appropriate design software according to a given time project

BCB38\*3

Elective - Green Building

Credit Hour: 3

Prerequisite: \*Tahun 3 sem 1/ amount credit i.e 70crhrs

### Synopsis

This course aims to expose the students the concept and application of green technology throughout the life-cycle of a building starting from planning, design, construction, operation and maintenance phases as well as for renovation and demolition processes. The course encompasses key principles of green building components, systems, materials and

design strategies in consideration to sustainable development. In addition, the course focuses on the use of Green Building Index (GBI) for the assessment of green building and introduces the use rating tools such as MYCREST and Sustainable INFRASTAR for sustainable construction.

### Course Learning Outcomes (CLO):

CLO1 Coordinate the principle of green building in different phases of building development

CLO2 Guide the use of rating tools to assess green building development towards achieving sustainable construction

CLO3 Advocate awareness on the need for sustainable development in building

BCB38\*3

Elective – Building Forensic

Credit Hour: 3

Prerequisite: \*Tahun 3 sem 1/ amount credit i.e 70crhrs

### Synopsis

The course aims to integrate and generate an advanced and in-depth knowledge in specific field of Building Forensic Engineering in professional practices. This program focuses on the failure of building structural and construction engineering. The purpose of a forensic engineering investigation is to locate cause or causes of failure with a view to improve performance or life of a building component. This subject will explain the method to investigate, to prepare the forensic report and method to repair building structure with best practice and effective.

### Course Learning Outcomes (CLO):

CLO1 Perform procedures for conducting a forensic structural investigation using appropriate tools

CLO2 Advocate information obtained from an investigation and present those findings in report

on legal aspects of forensic engineering

CLO3 Select the best and effective method to repair building structures failure and problem

**BCB38\*3**

Elective –Building Demolition

Credit Hour: 3

Prerequisite: \*Tahun 3 sem 1/ amount credit i.e 70crhrs

**Synopsis**

This course focuses on the procedures and methods of building demolition. Students learn how to safely demolish a structure, and this course may include study of an actual demolition. Demolition of building structures, may also be covered, as well as demolition equipment, methods and procedures.

**Course Learning Outcomes (CLO):**

CLO1 Demonstrate the fundamental concepts of demolition, its assessment and modern practices of demolition by construction industry

CLO2 Differentiate the type of demolition for building and structures for low-rise and high rise buildings, foundation, as well as pre-stressed and post-tensioned concrete structures .

CLO3 Classify the best practice demolition with various conditions for demolition project.

**BCB 3964**

Capstone Project For Technologist

Credit Hour: 4

Prerequisite: Taken PBL 1, PBL2, PBL3, PBL4 and PBL5

**Synopsis**

This course will expect the student to fully utilise all the knowledge of sub-civil engineering core discipline that they had gained in the previous semester. As a focus, the student will practice technology not only as a tool but also as enabler or provider to solve engineering project. The student are required to propose a project and will be working in studio. The student will manage the studio environment as a professional workplace to develop and practice the acquired engineering skills. Student will be working in groups and will be referred to and advised by Project Directors (Lecturers or Panel of Industry Representatives) as the experts in the sub-discipline of civil engineering core as determined by the faculty. Student will utilise

the available technology as tools to complete the to key deliverables of the proposed project. The size of the project will be decided by the Course Co-ordinator in a project brief.

Apart from the conventional civil engineering practices, the proposed project will incorporate the sustainable construction or green design approaches, analysis of geotechnical, structural, environmental sciences fundamentals using designated computer software, and the application of media simulation and visualisation software such as CAD/CAM / BIM into its design. With the main emphasis in project management skills, the programme will be collaborated with construction industry players, government agencies and local authorities related to the proposed or pre-determined project. In the design project proposal, the student are encouraged to integrate multidisciplinary engagement and stimulate real professional working environment throughout the study. Most of the time students are required to deliberate ideas and professional skills through engineering communications with the application of engineering technologies within the problem solving context. Assessment will be series of FOUR (4) critique sessions (60%) leading to the Final Presentation (40%) at the end of the semester.

**Course Learning Outcomes (CLO):**

CLO1 Propose conceptual or technical design as series of project development towards the completion of a final project of in the field of civil engineering profession

CLO2 Write technical reports as needed by the professional civil engineering practices

CLO3 Utilise technology to test, simulate, review and analyse the required design requirement of a proposed project as required by civil engineering profession

CLO4 Deliver professional communication skills through series of critique sessions and verbal presentation through group assignments and continuous assessments within the context of civil engineering disciplines

**BCA4054**

Final Year Project I (Industrial Based)

Credit Hour: 4

Prerequisite: Student Year 4 and above and

subject related to the research area must be taken

### Synopsis

This course focuses on the research-oriented approach to engineering technology studies. Students are expected to develop techniques in literature review, perform individual analysis and judgement and show capability of being assessed independently. The application of project management element as a medium for conducting and integration all expertise areas during the course is highly encouraged.

Student needs to conduct applied based on the proposed research methodology. Students have to complete the course by submitting the proposal and present at the formal presentation session. Students will be assessed on the ability to work independently.

### Course Learning Outcomes (CLO):

CLO1 Defend the understanding of fundamental and technical knowledge

CLO2 Justify research work through report and presentation

CLO3 Formulate project management according to engineering and technology practice

### BCA4042

Technologist and Society (Industrial Based)

Credit Hour: 2

Prerequisite: None

### Synopsis

This course will equip students with the understanding of engineering ethics and professional skills to produce well rounded technologists that not only multi-talented but also versatile in nature and provide students an insight into how he/she can make a difference and contribute to society being as technologist. Topic will be covered on disciplines of civil engineering, engineering vs engineering technology, roles of technologist, career path for technologist etc.

### Course Learning Outcomes (CLO):

CLO1 Adopt the aspects and procedures in a

professional environments of a technologist and their impacts to society

CLO2 Act upon a commendable attitude as a technologist who has high degree of professionalism and responsibilities in the context of social, cultural, and global environment

### BCA4244

Building Assessment & Reporting (Industrial Based)

Credit Hour: 4

Prerequisite: None

### Synopsis

This course focuses on the theory and practical aspects of assessing the quality of buildings. Learning is centered on the quality assessment system developed by the Construction Industry Development Board (CIDB) entitled Quality Assessment System in Construction (QLASSIC). Students are introduced to the method of measuring and evaluating the workmanship quality of a building construction work based on Construction Industry Standard (CIS 7). At the end of the course, students are expected to perform a practical QLASSIC assessment for buildings by producing a scoring system.

### Course Learning Outcomes (CLO):

CLO1 Hypothesize the construction quality assessment systems implemented by countries around the world

CLO2 Defend the procedures of performing QLASSIC in accordance to CIS 7 Standard

CLO3 Manage QLASSIC assessment procedures

CLO4 Justify approaches to measure and evaluate workmanship quality of building construction works

### BCA4066

Final Year Project 2 (Industrial Based)

Credit Hour: 6

Prerequisite: BCA4054 Final Year Project 1

### Synopsis

This course focuses on the research-oriented approach to engineering technology studies. Students are expected to develop techniques

in literature review, perform individual analysis and judgement and show capability of being assessed independently. The application of project management element as a medium for conducting and integration all expertise areas during the course is highly encouraged.

Student needs to conduct applied based on the proposed research methodology. Students have to complete the course by submitting the thesis with formal presentation and a written report. Students will be assessed on the ability to work independently.

#### Course Learning Outcomes (CLO):

CLO1 Construct technical documentation using appropriate tools

CLO2 Defend the solution towards problems on relevant topics

CLO3 Ability to engage in independent and lifelong learning in the broadest context of literature review

CLO4 Act upon a commendable attitude as a technologist who has high degree of professionalism and responsibilities in the context of social, cultural, and global environment

CLO2 Contribute idea to solve real time problem through involvement in various scopes of works such as planning concept, design, construction & project administration

CLO3 Perform effectively on complex civil engineering activities such as being able to comprehend and write effective reports and design documentation and make effective presentations

CLO4 Adhere to required professionalism and employ independent continuing learning in specialist technologist

CLO5 Behave according to organisations regulation and procedures while performing to basic professional skill during the available duration

BCA4012

Industrial Training Attachment (Industrial Based)

Credit Hour: 12

Prerequisite: Pass All Courses

#### Synopsis

This course involves placement of students in relevant industry for approximate 24 weeks duration to get real-world working experience. Every student will be assigned an advisor/lecturer from the faculty who will cooperate with the industrial counterpart. At the end of the industrial training, students need to submit report. In addition, the respective industrial counterpart need to evaluate and provide comments on the students performances. CIDB structured module will be used as a part of evaluation.

#### Course Learning Outcomes (CLO):

CLO1 Practice taught theories, tools and techniques throughout training session to resolve real time problem in the organization or working industry



## CURRICULUM STRUCTURE BACHELOR OF ENGINEERING TECHNOLOGY (ENERGY & ENVIRONMENTAL) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
COURSES	UHL2400 Fundamentals of English Language	UHL2412 English for Academic Communications	UHL2432 English for Professional Communication	UHL2422 English for Technical Communication	BTV3113 Wastewater Treatment Technology	BTV3143 Air Pollution Control Technology	BTV4**3 Elective 1	BTV4812 Industrial Training
	UGE2002 Technopreneurship	UHF11**1 Foreign Languages Level 1	UHF21**1 Foreign Languages Level 2	BTM1124 Machine Production Process	BTV3233 Solid and Scheduled Waste Management	BTV3433 Engineering Economy	BTV4**3 Elective 2	
	UHS1022 Soft Skills	UQ*2**1 Co-curriculum II	UHC2022 Penghayatan Etika dan Peradaban	BTM2234 Fluid Power Technology	BTV3224 Heating, Ventilating and Air Conditioning Technology	BTV3453 Energy Auditing	BTV4**3 Elective 3	
	UHC1012 Falsafah dan Isu Semasa	BUM1223 Calculus	BUM2113 Applied Mathematics	BTV2223 Environmental Management System	BTV3324 Design for Energy Efficiency and Green Materials	BTV3463 Energy Management	BTV4826 Engineering Technology Senior Design Project II	
	UQB1**1 Co-curriculum I	BTE2313 Computer Programming	BTM1113 Basic Manufacturing Processes	BTV2314 Green Technology	BTV3424 Facilities Management Technology	BTV3473 Safety & Risk Management		
	BUM1113 Technical Mathematics	BTM1614 Computer Aided Drafting	BTV2123 Environmental Law, Policy & Economics	BTV3413 Industrial Quality Control		BTV3813 Engineering Technology Senior Design Project I		
	BTU1113 Physics	BTV1113 Environmental Technology	BTV2213 Thermodynamics					
	BTU1112 Physics Laboratory	BTV1112 Environmental Technology Lab	BTV3333 Biobased Fuels and Alternative Energy Applications					
	BTE1213 Electrical Fundamentals							
	BTE1212 Electrical Fundamentals Laboratory							
<b>TOTAL CREDIT PER SEMESTER</b>	<b>20</b>	<b>19</b>	<b>20</b>	<b>20</b>	<b>18</b>	<b>18</b>	<b>15</b>	<b>12</b>
<b>TOTAL CREDIT FOR GRADUATION</b>	<b>142</b>							

**ELECTIVE COURSES FOR  
BACHELOR OF ENGINEERING TECHNOLOGY (ENERGY AND ENVIRONMENTAL) WITH  
HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BTV4703	Solar energy system	3
2	BTV4753	Environmental impact assessment	3
3	BTV4763	Geographic information system	3
<b>Total minimum credits of elective courses for graduation</b>			<b>9</b>

<b>PROGRAMME EDUCATIONAL OBJECTIVES (PEO)</b>	
PEO1	To produce energy and environmental related engineering technologists with mastery of the needed expertise in industries using the foundation of technology and innovation.
PEO2	To prepare engineering technologists that demonstrate skills of lifelong learning for professional and personal development.
PEO3	To prepare engineering technologists with good management skill, good professional ethics and understanding local law in energy and environmental issues.
PEO4	To prepare global engineering technologists that work and communicate effectively in multinational and multidisciplinary engineering community.

<b>PROGRAMME OUTCOME (PO)</b>	
PO1	To produce energy and environmental related engineering technologists with mastery of the needed expertise in industries using the foundation of technology and innovation.
PO2	Solve broadly-defined engineering technology problems systematically to reach substantiated conclusions by using appropriate tools and techniques in energy and environment area.
PO3	Design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Plan and conduct experimental investigations of broadly-defined engineering technology problems by using data from relevant sources related to energy and environment area.
PO5	Select and apply appropriate techniques, resources and modern engineering technology tools, with an understanding of their limitations in energy and environment related area.
PO6	Function effectively as individuals, and as members or leaders in diverse technical teams.
PO7	Communicate effectively with the technical community and society at large.
PO8	Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
PO9	Demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO10	Demonstrate an awareness of management, business practices and entrepreneurship in the field of energy and environment.

PO11	Demonstrate an understanding of the impact of technical practices, taking into account the need for sustainable development.
PO12	Recognize the need for professional development and to engage in independent and lifelong learning in the field of energy and environment.

## COURSE SYNOPSIS

### **COURSE SYNOPSIS FOR DEGREE PROGRAMME 2020/2021 BACHELOR OF ENGINEERING TECHNOLOGY (ENERGY AND ENVIRONMENTAL) WITH HONOURS**

BTU1113  
Physics  
Credit Hours: 3  
Pre-requisite: None

#### Synopsis

This course introduces a fundamental of physics. It covers unit and measurements, kinematics, forces and Newton's law of motion, statics equilibrium, work, energy and power, fluid mechanics, electric and magnetism.

#### Course Outcomes

By the end of semester, students should be able to:

- CO1: Illustrate basic concepts, theories and principles of physics in engineering application.
- CO2: Solve physics problem in statics, dynamics, electric and magnetism.
- CO3: Demonstrate physics concepts in a team.

BTU1112  
Physics Laboratory  
Credit Hours: 2  
Pre-requisite: None

#### Synopsis

This laboratory introduces the students with the application of physics concept in engineering devices such as free fall, Bernoulli's law, hydrostatic pressure and electric field. The concepts of physics introduced related in mechanics or dynamics motion and basic concepts of electrical area. The students will learn how to run the experiment with referring to the basic concepts of physics during the lab hours.

#### Course Outcomes

By the end of semester, students should be able to:

- CO1: Understanding the basic concepts, theories and principles of physics in engineering application.
- CO2: Demonstrating skills in logical thinking in handling equipment.
- CO3: Applying basic physics concepts to problem solving.
- CO4: Applying physics knowledge to personal decisions involving physical problems.

BTE1213  
Electrical Fundamentals  
Credit Hours: 3  
Pre-requisite: None

#### Synopsis

This module will introduce students to basic science of electricity, introduction to instrumentation and measurement, work and energy theorem, basic electrical circuits and introduction to magnetism.

#### Course Outcomes

By the end of semester, students should be able to:

- CO1: Describe the basic concept of electricity, conductors, insulators, circuit, magnetism and other devices.
- CO2: Apply basic electrical laws such as Ohm and Kirchhoff Law to solve circuit or electrical problems.
- CO3: Shows the ability to communicate effectively.

BTE1212  
Electrical Fundamentals Laboratory  
Credit Hours: 2  
Pre-requisite: None

#### Synopsis

This course introduces students to the fundamentals laboratory of DC and AC circuits

and basic network laws and theorems. The students will be handling the basic measurement equipment to measure and analyse the parameter of the electrical circuits.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Construct simple electrical and electronics and simulate the operation of the circuits using circuit simulation software (OrCAD).

CO2: Measure parameter of electrical circuits (resistance, voltage, current, etc).

CO3: Work ethically and effectively as an individual and in a group.

#### BTE2313

Computer Programming

Credit Hours: 3

Pre-requisite: None

#### Synopsis

Fundamental principles and concepts of C++ programming, with definitions of data, expressions, control-flow constructions, functions, input and output and preprocessing. Basic problem solving and programming techniques, structured programming ideas, fundamental algorithms and data structures (array).

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Construct computer programs using C++ language.

CO2: Develop appropriate programming techniques and program control structures.

CO3: Display the ability to use IDE (Integrated Design Environment) for C++.

CO4: Propose an algorithm for a specific problem by implementing appropriate programming techniques.

#### BTM3314

Computer Aided Drafting

Credit Hours: 4

Pre-requisite: None

#### Synopsis

This course is a basic and advanced computer aided drafting in 2D. CAD tools required to document engineering designs. This subject is designed to introduce to the student the principle of computer-aided design including drafting, drawing, dimensioning, tolerances and commands.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Analyse technical drawing.

CO2: Apply basic geometric construction technique in creating 2D object and projecting 3D object in 2D space.

CO3: Perform working drawing with its components and follow the standards that apply.

CO4: Display geometric dimensioning and tolerancing in working drawing.

#### BTV1113

Environmental Technology

Credit Hours: 3

Pre-requisite: None

#### Synopsis

The study of environmental technology and environmental preventive and mitigation measures in the industries. Case studies and local environmental issues will be analysed to evaluate potentially adverse outcomes of environmental technology in relation to existing legislation (EPA, EQA 1974 & OSHA 1994, FMA 1967) and other existing public policies. The course will also address the human health and economic impact in the private sector.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Outline the concept of environmental technology as well as environmental preventive and mitigation measures.

CO2: Integrate concept of environmental technology and environmental preventive and mitigation measures in few case studies and local environmental issues in Malaysia.

CO3: Recognize the needs for professional development in environmental and sustainability in the broad scope of industrial sector.

BTV1112

Environmental Technology Lab

Credit Hours: 2

Pre-requisite: None

#### Synopsis

This course will focus on environmental testing techniques, common environmental laboratory protocols, data analysis and reporting. Topics will cover the quality of water, wastewater, air, and noise through the use of modern tool equipment. Skills gained will be directly applicable to careers in environmental technology both in data collection and managing field assessments especially for industry. The course will provide an appreciation for the effort involved in environmental samples testing, and an ability to critically evaluate data from a sampling program.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Apply environmental related knowledge by performing field and lab scale experiments.

CO2: Demonstrate the ability to use a variety of modern tools necessary for carrying out environmental monitoring and assessment.

CO3: Perform environmental monitoring and assessment in a team.

BTM1113

Basic Manufacturing Processes

Credit Hours: 3

Pre-requisite: None

#### Synopsis

Introduction to the materials, techniques, and equipment of industrial manufacturing. Emphasis on laboratory demonstration and simulation activities such as machining, welding, casting, and forming operations.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Identify various states of matter, structure and properties of basic engineering materials and their relationship.

CO2: Describe the fundamental differences between ferrous and nonferrous alloys and their configuration and applications.

CO3: Identify different manufacturing processes and their applications.

CO4: Analyse process parameters in operation and their effect on the quality.

BTV2123

Environmental Law, Policy and Economics

Credit Hours: 3

Pre-requisite: BTV1112 and BTV1113

#### Synopsis

This module will introduce students on the history of environment law and legislation system that applied in our country. The students will exposure the applied the of EQA 1974 Act to the industries, construction, agriculture and other activities that required under the act. Students will learn the environmental policies that applied in other country, the turns of economics on environmental analysis and the mitigation measures action. The module goal is to enable the student to practise the environmental law and policies in the industries sectors and identify mitigation measures that suitable to overcome the environmental problem.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Describe environmental legislation, regulation, policies and environmental economic.

CO2: Discriminate an environmental problem with related law and regulation, and mitigation measure approaches to improve environmental quality management.

CO3: Practise to the Environmental law and regulation to the environmental issues and cases.

BTV2213

Thermodynamics

Credit Hours: 3

Pre-requisite: BTU1113

#### Synopsis

This course deals with properties of a simple pure compressible substance, equations of state, the first law of thermodynamics, internal energy, specific heats, enthalpy and the application of the first law to a system or a control volume. The study of the second law of thermodynamics is also discussed leading to the discovery of entropy as a property and its ramifications.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Apply knowledge on energy transfer and transformation in systems using fundamental concepts of properties of materials, work, heat, internal energy, entropy, equilibrium, and relations derived from the First and Second Laws of Thermodynamics.

CO2: Analyse the concept of heat and work to the engineering problems.

CO3: Solve broadly define thermodynamic problems involving first and second law of thermodynamics.

BTV3333

Biobased Fuels and Alternative Energy Applications

Credit Hours: 3

Pre-requisite: None

#### Synopsis

Overview of bio-fuel sources, production, and

applications. Review of conventional energy supplies and uses. The study of liquid and gaseous fuels derived from plant and animal matter, utilizing of biofuels for combustion, stationary power, and transportation. Study of biofuels used in conventional and alternative manners, Energy from Biomass; Bioreactor design, sustainability, environmental impacts, economic and social issues, and global governmental policies. Biohydrogen production, pretreatment of biomass and nanotechnology for biofuel production topics from an applied perspective of technology practices, with implementing large-scale consumption of biofuels.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Describe the fundamentals and main characteristics of biobased energy sources and analyse their environmental impact/problems compared to fossil fuels.

CO2: Development of integrative energy efficiency systems.

CO3: Design biofuel energy systems that meet specific energy demands, are economically feasible and have a minimal impact on the environment.

BTM1124

Machine Production Process

Credit Hours: 4

Pre-requisite: None

#### Synopsis

This course intends to provide detailed study of conventional methods of metal machining. Laboratory experience includes the fundamentals of machine tool setup and operation, precision measurement techniques, and machine tool safety, care and maintenance.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Discover basic machine tool processing knowledge, abilities and skills.

CO2: Expand machine tool processing knowledge, abilities and skills through experience with conventional process.

CO3: Practise the ethics of workplace safety during completion of assigned projects.

CO4: Recognize the function, application as well as limitations of machine tool processes through examination, discussion and operation.

BTM2234

Fluid Power Technology

Credit Hours: 4

Pre-requisite: BTU1113

#### Synopsis

This course consists fundamental of fluid mechanics and fluid power system. Fundamental of fluid mechanics including properties of fluid, fluid in static and fluid in motion. Fluid power system including fluid power principles, devices, materials, hydraulic and pneumatic systems with emphasis on pumps, compressors, motors, and actuators.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Use the fundamental of fluid mechanics and fluid power including properties of fluid, fluid flow, hydraulics system and pneumatics system to solve problems in both of these fields.

CO2: Analyze and solve problems in fluid mechanics by applying the Bernoulli's equation and energy equation.

CO3: Sketch and construct basic circuits to solve the problems regarding pneumatic and hydraulic system that are applied in the daily lives.

CO4: Demonstrate theoretical and experimental data in spoken presentation and written lab report in order to understand the fundamental concept of fluid mechanics.

BTV2223

Environmental Management System

Credit Hours: 3

Pre-requisite: None

#### sSynopsis

The demand for trained practitioners in environmental management system at the project level and related environmental management fields continues to grow. To meet this demand, this module provides an opportunity for specialist study in the principles of sustainability, international and national policy, approaches to valuing the environment, attitudes to conservation and the role of the public in environmental decision-making. The module emphasizes fieldwork or case studies.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Relate the systems and approaches of environmental management system which are being increasingly used in industry.

CO2: Monitor and improve environmental performance.

CO3: Adapt and meet the challenge of sustainable development.

BTV2314

Green Technology

Credit Hours: 4

Pre-requisite: None

#### Synopsis

Introduction to environmentally friendly engineering and technological advances and new technologies that utilize green principles and green transportation. Course includes topics in new areas of green manufacturing and materials used today and planned for the future, including the operation and manufacture of solar cells and the production of wind, thermal, and hydroelectric power. Topics will vary depending upon new trends in industry. Several experiments related to green technology were exposed in this subject.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Propose alternative renewable technologies considering availability of the



different energy resources and environmental needs.

CO2: Operate various types of renewable energy equipment and perform measurement and data collection.

CO3: Demonstrate ethical responsibility towards environment and sustainability by applying green technology principles.

BTV3413

Industrial Quality Control

Credit Hours: 3

Pre-requisite: None

#### Synopsis

This course will present the fundamental concepts and methods of quality monitoring including Problem solving tools (cause and effect diagrams, scatter diagrams, run charts etc.), normal curves, control charts, process capability and acceptance sampling. The use of control charts and statistical tools determine the stability and capability of processes to produce quality product. The implementation and applications of quality management systems such as TQM, ISO9000 and Six sigma will be briefly studied.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Understand the philosophy and basic concepts of quality improvement, problem solving techniques, and describe the PDCA process (plan, do, check and act).

CO2: Perform analysis of statistical process control tools (variable control chart, attribute control charts), process capability of industrial operations.

CO3: Engage in independent and lifelong learning about industrial quality control in industrial cases of TQM, Six sigma and continuous improvement.

BTV3113

Wastewater Treatment Technology

Credit Hours: 3

Pre-requisite: BTV2123

#### Synopsis

Water and wastewater technology focus on design and operation of water and wastewater treatment systems. This course prepare students for certification examinations administered by Malaysia Government as well as those administered by professional associations within the water and wastewater industry.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Develop understanding on regulatory framework on industrial pollution control as regulated by Industrial Effluent Regulation (IER) and develop ability to perform engineering process design of industrial effluents treatment system (IETS).

CO2: Measure, determine, perform and interpret the water and wastewater treatment system experiment as a group.

CO3: Demonstrate technical skills in using computer statistical software for analyzing and interpreting IETS performance monitoring data.

BTV3233

Solid and Scheduled Waste Management

Credit Hours: 3

Pre-requisite: BTV2123

#### Synopsis

This course introduces the student to the physical, chemical and toxic properties of solid and Scheduled waste which are the basis for their hazard classification, movement and distribution as well as their impacts on human health and the environment. The industries which generate solid and Scheduled waste will be identified. The management of these wastes which include handling, storage and transportation based on the regulations stipulated in the Environmental Quality Act, 1974 and Solid Waste and Public Cleansing Management 2007, (Act 672). The treatment and disposal processes will be emphasized including pollution prevention and waste minimization strategies.

### Course Outcomes

By the end of semester, students should be able to:

CO1: Apply the theories and principle of solid and scheduled waste management, the impact and the risks towards human health and environment.

CO2: Conduct case studies for best practices solid and scheduled waste management.

CO3: Apply various solid and scheduled waste treatment technologies in the industries as Competent Person.

### BTV3224

Heating, Ventilating and Air Conditioning Technology

Credit Hours: 4

Pre-requisite: BTV2213 and BTM2234

### Synopsis

Heat gains and losses, heat producing equipment, cooling, and refrigeration equipment are studied. Human comfort and air quality requirement and efficient design of HVAC system for commercial, industrial, and residential systems.

### Course Outcomes

By the end of semester, students should be able to:

CO1: Examine the operation of common HVAC equipment such as chillers, cooling towers, heat exchangers and recognise the energy cost associated with them.

CO2: Design air heating and cooling processes and perform basic heating and cooling load calculations.

CO3: Demonstrate technical communication skills (written, sketches, charts and graphs).

CO4: Engage in independent and lifelong learning with the broad scope of human comfort requirement in residential, commercial and industrial settings.

### BTV3324

Design for Energy Efficiency and Green Materials

Credit Hours: 4

Pre-requisite: BTV2213

### Synopsis

Overview of energy forms, sources, generation, devices, systems, and materials. Review of the physics of energy transformation and conservation. Energy efficiencies of components and systems from stationary and transportation sectors. Energy-efficient design in residential, commercial, industrial, and manufacturing systems. Sustainability, environmental impacts, economic and social issues, and global governmental policies. Potential of alternative energy sources. Use of eco-friendly materials to improve efficiency. Topics from an applied perspective of technology practices, management, responsibilities, and policies involved with implementing energy conservation designs.

### Course Outcomes

By the end of semester, students should be able to:

CO1: Explain the concepts of conversion of mass, conservation of energy and the second law of thermodynamics.

CO2: Measure and evaluate energy exchange.

CO3: Design a comprehensive understanding of a system that applies the principles of conversion of mass and energy.

### BTV3424

Facilities Management Technology

Credit Hours: 4

Pre-requisite: None

### Synopsis

An overview of the technology facility management responsibilities, policies, and practices involved in implementing and/or managing technology properties that have sustainable goals connected to them. Identification of competencies needed by the technology facility management function to properly design, operate, and maintain facilities within the scope of

responsibilities of technology facilities managers.

By the end of semester, students should be able to:

CO1: Demonstrate understanding of Facilities Management technology components, scopes and applications.

CO2: Analyze and estimate requirements (maintenance, budgetary, working condition) and resources needed for the efficient management of facilities.

CO3: Ability to manage or lead projects efficiently, how to meet the challenge, and add project management skills to their repertoire.

BTV3143

Air Pollution Control Technology

Credit Hours: 3

Pre-requisite: BTV2123

Synopsis

The topics in this course discuss several important aspects of air pollution that include classification and sources of air pollutants, their impact to environment, sampling methods, preventing and controlling air pollution, Pollution control technology and air quality management system will be discussed.

Course Outcomes

By the end of semester, students should be able to:

CO1: Define the terminologies, theories and principle of air pollution technology.

CO2: Demonstrate the specific air pollutants and its control technology.

CO3: Predict the air pollution problem and preventing action.

BTV3433

Engineering Economy

Credit Hours: 3

Pre-requisite: None

Synopsis

This course introduces concept of life cycle

cost, interest and equivalent. Formula and factors for single and multiple cash flow. Method for investment assessment and alternative comparison and project evaluation using cost worth ratio, inflation and cash flow method.

Course Outcomes

By the end of semester, students should be able to:

CO1: Understand basic principles of engineering economy, cost estimation, money-time relationships.

CO2: Apply analytical and numerical methods for evaluation of engineering projects to come up with best alternatives.

CO3: Use computer to solve problems using Microsoft programs such as Excel etc.

BTV3453

Energy Auditing

Credit Hours: 3

Pre-requisite: BTV2213

Synopsis

Basics of energy auditing, energy accounting and analysis and understanding the utility bill for buildings and industrial plants including the use and application of survey/measurement instruments will be discussed. The auditing of building envelopes, electrical systems, HVAC systems and energy efficiency improvement and operation of industrial boiler systems will be highlighted in this course.

Course Outcomes

By the end of semester, students should be able to:

CO1: Illustrate energy audit basic concepts, theories, principles, documentation and develop method of auditing current energy for best utilization practice of buildings and industrial plants.

CO2: Demonstrate the ability to use a variety of modern tools necessary for carrying out energy auditing of buildings and industrial plants.

CO3: Engage in independent and lifelong learning with the broad scope of energy

auditing and energy conservation opportunities.

BTV3463  
Energy Management  
Credit Hours: 3  
Pre-requisite: BTV2213

#### Synopsis

This course is designed to emphasize the importance of energy in human's life by reviewing the national and global energy scenario. The students will be exposed to the principle of Sustainable Energy Management System (SEMS) and make them capable to setup the system at real application. The content of this course consists of fundamental of energy and energy management, energy policies and legislations, energy efficiency and conservation programs and methodology of SEMS implementation based on Asean Energy Management Scheme (AEMAS). Green building components also considered as part of this course.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Relate global and local energy scenario, fundamental of energy and energy management system, energy policies and legislations, economics and energy efficiency & conservation programs.

CO2: Acquaint with the principle and methodology of Sustainable Energy Management System (SEMS) and able to setup the system at real application.

CO3: Engage in independent and lifelong learning with the broad scope of energy management opportunities.

BTV3473  
Safety & Risk Management  
Credit Hours: 3  
Pre-requisite: None

#### Synopsis

This course introduces the principles and

basic concepts of safety and risk management practice in the industries. Students will be exposed to the fundamental scopes of Occupational Safety Health and Environment (OSHE) in organization, comprehend the reasons why OSHE has to be managed, the acts and legislations in relation to OSHE, analyzed the sources of OSHE harm and their effects and choose the appropriate risk management way in managing the OSHE hazards and understand their responsibilities in practicing all of the safety elements in the workplace.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Evaluate the occupational safety health and environment (OSHE) fundamentals theory to identify hazards, risk and exposure at the workplace.

CO2: Integrate concept of occupational safety health and environment (OSHE) in few case studies and local industrial issues in Malaysia.

CO3: Recognize the needs for professional development in risk management in the broad scope of industrial sector.

BTV3813  
Engineering Technology Senior Design Project I  
Credit Hours: 3  
Pre-requisite: None

#### Synopsis

Overview of energy forms, sources, generation, devices, systems, and materials. Review of the physics of energy transformation and conservation. Energy efficiencies of components and systems from stationary and transportation sectors. Energy-efficient design in residential, commercial, industrial, and manufacturing systems. Sustainability, environmental impacts, economic and social issues, and global governmental policies. Potential of alternative energy sources. Use of eco-friendly materials to improve efficiency. Topics from an applied perspective of technology practices,

management, responsibilities, and policies involved with implementing energy conservation designs.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Ability to identify problem and determine path for solution.

CO2: Ability to interact with supervisors to discuss project details.

CO3: Ability to function on design team.

CO4: Ability to apply ethics and quality concepts to design task.

CO5: Ability to apply engineering economy concepts and societal issues to design task.

CO6: Understanding of research in project development and component determination.

#### BTV4703

##### Solar Energy System

Credit Hours: 3

Pre-requisite: BTE1213 and BTV2213

#### Synopsis

The course is intended for students who have interest in alternate energy sources as a contributor to sustainability. It provides a comprehensive treatise on the science and technology of solar energy, its collection and the design principles that need to be understood for its effective use in a variety of installations and uses. At the end of the course the students should be able to understand the factors that influence the use of solar radiation as an energy source, know the various active and passive technologies that are available for collecting solar energy and have the ability to apply design principles to selection of an appropriate solar energy installation to meet requirements.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Distinguish the terminologies, principle of solar energy and the mechanism of heat transfer including techno economics analysis.

CO2: Demonstrate the application of

principle of solar energy in solar technology system.

CO3: Engage in independent and lifelong learning of solar energy technologies.

#### BTV4753

##### Environmental Impact Assessment

Credit Hours: 3

Pre-requisite: None

#### Synopsis

This course addresses the constraints and opportunities that natural environment brings to the success of development. The emphasis is on the development and correct application of the fundamental concepts of environmental impact assessment (EIA). Topics covered are an introductory guide to EIA, Scoping methods and baseline studies in EIA, Developments in EIA methods, Environmental Management Planning (EMP), Environmental Management System (EMS) and application of EIA. In addition students will also be exposed to environmental regulations and strategies in environmental protection via EIA and EMS. The emphasis is on theoretical background, site visit and application through EIA report.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Explain the impacts of the environmental of a proposed project based on EIA requirement.

CO2: Illustrate the appropriate pollution control technique and mitigation measure prior to project approval.

CO3: Evaluate the concept of Environmental Management Plan and Environmental Management System.

#### BTV4763

##### Geographic Information System

Credit Hours: 3

Pre-requisite: None

#### Synopsis

This course offers an introduction to the

concepts, principles, and theories behind Geographic Information Systems and Science (GIS), with emphasis on the nature of geographic information, data models and structures for storing geographic information, geographic data input, data manipulation, and simple spatial analysis and modeling techniques. The course is composed of two components: lectures and labs. The lectures will discuss the concepts, principles, and theories behind GIS and the labs will reinforce the concepts and principles through hands-on exercises and projects. Students must be clear that this is not a class on any specific GIS software. It is a course on the underpinning theory and concepts in GIS. However, students will be exposed to the major commercial GIS software packages of ArcGIS in their labs.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Practice the concepts, principles, techniques and applications that are fundamental to GIS and that differentiate GIS and geographic science from other information systems, technologies and sciences.

CO2: Interpret the nature and characteristics of geospatial data, data representations, methods of data input and editing, and data organization/management in GIS.

CO3: Apply GIS concepts, principles and techniques to real-world spatial problem solving and mapping applications.

CO4: Combine different types of spatial analysis to meet specified need of GIS project.

#### BTV4826

Engineering Technology Senior Design Project II

Credit Hours: 6

Pre-requisite: None

#### Synopsis

This course is designed to expose the students to a senior design project. They have to apply all the knowledge that they have learned in the program to complete the senior

design project. Each student will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor). During the senior design project I, the students will be able to do a literature survey and prepare a draft which contains objective of the project, problem statement, literature survey, solving techniques, methodology, and expected result, treatment of results and list of reference publications. At the end of this subject, the students are required to present the draft in a short seminar which will be evaluated by a faculty's panel.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Ability to identify problem and determine path for solution.

CO2: Ability to interact with supervisors to discuss project details.

CO3: Ability to function on design team.

CO4: Ability to apply ethics and quality concepts to design task.

CO5: Ability to apply engineering economy concepts and societal issues to design task.

CO6: Understanding of research in project development and component determination.

#### BTV4812

Industrial Training

Credit Hours: 12

Pre-requisite: None

#### Synopsis

In Industrial Training the students should gain insight into industrial practice, in order to visualize the tasks and possibilities of their later occupation work. All students are required to undergo and industrial training for a certain period that has been agreed by the faculty during last semester of the academic year. The performance of each student during the periods of his/her industrial training is evaluated by the faculty staff, and the representatives from employer organization.

#### Course Outcomes

By the end of semester, students should be able to:

CO1: Initiate effort to apply acquired technical skill for problem solving in the industry.

CO2: Function as a professional and ethical trainee in an organization during the industrial training.

CO3: Demonstrate a professional commitment and responsibilities at workplace.

CO4: Present the outcomes of industrial training in a formal oral presentation.

CO5: Conduct an analysis on one main issue discovered during industrial training.

## Course Outcome

At the end of semester, student should be able to:

CO1: Experience actual working environment at the workplace and use information and data collected in the logbook as prime source for writing a technical report

CO2: Practice relevant theory in carrying duties at the workplace as well as making arrangement, assessing and discuss the results of the data while making reference to prevailing standards and specifications

CO3: Argue or support about the fulfillment of the project objectives and recommend for further works. and use logbook as diary for technical personal

CO4: Learn new skills at workplace and later demonstrate, describe, discuss, illustrate , argue and predict about the finding of the project in an oral presentation.

CO5: Communicate and work as team member with all level of work force



**CURRICULUM STRUCTURE  
BACHELOR OF ENGINEERING TECHNOLOGY (INFRASTRUCTURE MANAGEMENT) WITH HONOURS**

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
	UHL2400 English For Technical Communication	UHL2412 English For Academic Communication	UHL2422 English For Technical Communication 2	UHL2432 English For Professional Communication	UHF1**1 Foreign Language Level 1	UHF2**1 Foreign Language Level 2	BET4783 Final Year Project 2	BET4812 Industrial Training (24 weeks)
	UHC2022 Penghayatan Etika dan Peradaban	UQA2002 Kokurikulum	UHC1012 Falsafah dan Isu Semasa	UHS1022 Soft Skills	UHE3122 Islamic Institutions	BET4042 Entrepreneurship for Technologists	BET4774 Technology Design Project	
	BUM1223 Calculus	BET1303 Applied Physics	BUM2413 Applied Statistics	BET1263 Geology and Geomechanics	BET3582 Digital Construction Technology	BET3683 Final Year Project 1	BET4**3 Elective 1	
	BET1114 Infrastructural Exploration (Studio 1)	BET2373 Construction Engineering	BET2413 Project Scheduling	BET2344 Infrastructural Planning (Studio 4)	BET3563 Building Facilities & Maintenance	BET3644 Infrastructural Management (Studio 6)	BET4**3 Elective 2	
	BET1123 Introduction to Infrastructural Engineering	BET1213 Engineering Practice 1	BET2334 Infrastructural Project (Studio 3)	BET2422 Financial Management for Decision Making	BET4222 Technologist in Society and Law	BET3593 Quality Performance Management	BET4**3 Elective 3	
	BET1142 Introduction to Engineering Surveying	BET2343 Spatial Science Engineering	BET2573 Construction Methods	BET1113 Green Technology for Infrastructure Facilities	BET3634 Infrastructural Design (Studio 5)	BET1613 Engineering Practice 3		
	BET2483 Problem Solving and Analysis	BET1474 Infrastructure Investigation (Studio 2)	BET1252 Urban Infrastructure	BET1413 Engineering Practice 2	BET3522 Procurement for Infrastructural Project	BET3513 Conflict and Risk Management		
					BET2492 Construction Safety			
<b>TOTAL CREDIT</b>	<b>17</b>	<b>20</b>	<b>19</b>	<b>19</b>	<b>18</b>	<b>19</b>	<b>16</b>	<b>12</b>
<b>TOTAL CREDIT FOR GRADUATION</b>	<b>140</b>							

**ELECTIVE COURSES FOR  
BACHELOR OF ENGINEERING TECHNOLOGY (INFRASTRUCTURE MANAGEMENT) WITH  
HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BET4713	Forensic Investigation in Infrastructure	3
2	BET4723	Advance Material Testing Technology	3
3	BET4743	Advanced Project Planning	3
4	BET4753	Engineering Management	3
<b>TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION</b>			<b>9</b>

<b>PROGRAMME EDUCATIONAL OBJECTIVES (PEO)</b>	
PEO1	To produce knowledgeable graduates in field of civil and infrastructural engineering through academic program.
PEO2	To produce competent and applicable graduates in civil and infrastructural engineering operation and maintenance technology.
PEO3	To produce graduates with high value and ethic through active participation in learner society activities.

<b>PROGRAMME EDUCATIONAL OBJECTIVES (PEO)</b>	
At the end of the programme, graduates should be able to (adapted from the Sydney Accord):	
PO1	Apply knowledge of mathematics, science, engineering fundamentals and engineering specialization principles to defined and applied engineering procedures, processes, systems or methodologies.
PO2	Solve broadly-defined engineering problems systematically to reach substantiated conclusions, using tools and techniques appropriate to their discipline or area of specialization.
PO3	Design solutions for broadly-defined engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Plan and conduct experimental investigations of broadly-defined problems, using data from relevant sources.
PO5	Select and apply appropriate techniques, resources and modern engineering tools, with an understanding of their limitations.
PO6	Function effectively as individuals, and as members or leaders in diverse technical teams.
PO7	Communicate effectively with the engineering community and society at large.
PO8	Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
PO9	Demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO10	Demonstrate an awareness of management, business practices and entrepreneurship.
PO11	Demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.
PO12	Recognize the need for professional development and to engage in independent and lifelong learning.

**COURSE SYNOPSIS****COURSE STRUCTURE FOR BACHELOR OF ENGINEERING TECHNOLOGY (INFRASTRUCTURE MANAGEMENT) WITH HONOURS**

BUM1223

Calculus

Credit: 3

Prerequisites: None

**Synopsis**

This course introduces Polar Coordinates and Vector, Vector-Valued Functions, Partial Derivatives, and Multiple Integrals. Appropriate software is used by students to implement some of these ideas in practice.

**Course Outcome**

CO1 Analyze and apply appropriate calculus concepts to solve various science and engineering problems.

CO2 Use appropriate software and tool to solve the graphical and computational problems in calculus.

CO3 Analyze and think critically a wide range of problem and solve it using ideas and methods in calculus.

CO4 Relate and applied the concepts and methods studied into other courses.

BUM2413

Applied Statistics

Credit: 3

Prerequisites: None

**Synopsis**

This course discusses on statistical problem-solving methodology and descriptive statistics; sampling distribution and confidence interval; hypothesis testing; analysis of variance (ANOVA); goodness-of-fit test and contingency tables; regression and correlation including simple and multiple linear regressions. Statistical packages such as Microsoft Excel, SPSS, R Language, S Plus, EViews and Minitab shall be used in this

course.

**Course Outcome**

CO1 Analyze data using statistical theory and methodology, draw a conclusion and give a suggestion based on the data analysed.

CO2 Perform statistical data analysis using available statistical packages including scientific calculator.

CO3 Apply statistical concepts and methods to solve related problems in various disciplines.

CO4 Formulate statistical model from a given data set.

BET1113

Green Technology for Infrastructure Facilities

Credit: 3

Prerequisites: None

**Synopsis**

This course will expose to the students the concept and application of green technology for construction especially in the area of infrastructural facilities. The subject topics encompasses introduction to the green technology, elements of green construction, economic analysis on green construction, green project requirement and application of green technology in infrastructure facilities such as road and highway, drainage, sewerage system, water reticulation and utilities.

**Course Outcome**

CO1 Identify and describe the definition and the principle of green technology in construction especially for infrastructural facilities.

CO2 Describe the engineering problems and solve the problem by applying the element of green technology.

CO3 Manage project or function as a resourceful individual while conducting a group project of infrastructural facilities.

BET1303

Applied Physics  
Credit: 3  
Prerequisites: None

#### Synopsis

This course is intended to expose the central ideas and principles of physics to students requiring a general background in physics. It covers unit and measurements, kinematics, forces and Newton's law of motion, statics equilibrium, work, energy and power, fluid mechanics, electricity and magnetism.

#### Course Outcome

CO1 Apply basic Physics concepts and theories learned to solve problems covered in the syllabus in terms of physical principles and concepts.

CO2 Explain solution of any related problems using the right principles and laws.

CO3 Report the solutions of a given physical problem covered in the syllabus by a group activity.

BET1114  
Infrastructure Exploration (Studio 1)  
Credit: 4  
Prerequisites: None

#### Synopsis

This course will expose students to the fundamental elements of a good engineering approach to problem solving with strong reference to basic sciences and math skills as well as testing and evaluation ideas by building prototypes (it could be a product, a technique, a structure, a project, a method, paperwork or many other things depending on the problem). The learning approach of these subjects is a design driven curriculum with emphasis placed on skills such as team based design, communication skills (graphical, oral and written) and computer aided design tools.

#### Course Outcome

CO1 Explain the flow and processes of construction practice and the importance of desk study for the project.

CO2 Analyse the principles of wastewater and stormwater management using appropriate guidelines.

CO3 Produce a technical drawing using computer aided design tools.

CO4 Demonstrate the technical drawing, stormwater and water supply management for sustainability development.

BET1123  
Introduction to Infrastructural Engineering  
Credit: 3  
Prerequisites: None

#### Synopsis

The course covers on introduction to civil engineering, planning for civil engineering project, structural and infrastructural design, project BQ and cost estimation, project report and engineering drawing, IT as value added in project development and implementation.

#### Course Outcome

CO1 Apply knowledge of certain infrastructure for a case study.

CO2 Develop analysis skills of certain infrastructure.

CO3 Embed lifelong learning while studying particular infrastructure properties.

BET1142  
Introduction to Engineering Surveying  
Credit: 2  
Prerequisites: None

#### Synopsis

This subject will expose to the students the role of survey engineering in their field. The subject topics encompasses introduction to the engineering surveying, surveying equipment, measurement unit, bearing/angle and distance measurement for horizontal control, coordinate system, area & volume calculation, and the final setting out for construction work.

#### Course Outcome

CO1 Apply the range of calculations that can be made with surveying data i.e. An ability to make a necessary calculation to fix position of forming the point of building in construction work project.

CO2 Conduct the fieldwork to perform horizontal and vertical control based on related provision by using equipments/modern tools.

BET1213

Engineering Practice 1

Credit: 3

Prerequisites: BET1123 & BET1142

#### Synopsis

This course is the first of a series of Practice courses that are intended to enable students to acquire engineering and professional practice skills in the field of water and environment. Students will generally work in teams to assist with the building of group synergy such as team working and interactive thinking. The development of other professional practice skills, such as written and oral communication, is also encouraged in the engineering practice courses. In this introductory course, students will undertake practical work primarily in the areas of fluid mechanics, hydraulics and environment.

#### Course Outcome

CO1 Apply fundamental and theories of fluid mechanics, hydraulics and environmental engineering using various methods.

CO2 Demonstrate practical skills in handling fluid mechanics, hydraulics and environmental laboratory equipment.

CO3 Demonstrate appropriate techniques and resources in water leak detection.

BET2343

Spatial Science Engineering

Credit: 3

Prerequisites: BET1142

#### Synopsis

This course offers an introduction to the

principles and theories of spatial science fields, data quality, spatial analysis, coordinate system, map projection and cartography. The syllabus also discuss geospatial technologies such as geographic information system, remote sensing, global navigation system and UAV. Students will utilize QGIS, Google Earth or ArcGIS in hands-on exercises and project.

#### Course Outcome

CO1 Analyze spatial science components, data, applications and contributions to the communities.

CO2 Apply spatial science concepts, principles and techniques to spatial problem solving and mapping applications in infrastructure engineering principles.

CO3 Communicate the preparation, execution and presentation of the spatial science project assigned effectively.

BET1474

Infrastructure Investigation (Studio 2)

Credit: 4

Prerequisites: BET1114

#### Synopsis

The aims of the course are to developed students' professionalism and ethical responsibilities skills, effective communication abilities with other multidisciplinary professions, effective team working skill, awareness about sustainable environment, desires for lifelong learning, utilization of moderns tools and technologies and techno-preneurship skills using technical knowledge that have been learned to date. Although it is PBL in nature, lectures and e-learning sessions are conducted as to provide general guidance to the groups.

#### Course Outcome

CO1 Manage project or function as a resourceful individual while observing the professional and ethical responsibilities.

CO2 Communicate effectively in-team and with external parties as to share ideas or get feedbacks from the stakeholders.

CO3 Plan and design/undertake projects as

a group effort.

BET2413  
Project Scheduling  
Credit: 3  
Prerequisites: BET2373

#### Synopsis

This course attempts to explain the importance of scheduling and estimating process in infrastructure project planning. The discussion will focus on approach and strategies in developing viable schedules and cost estimation which influences the success level of projects and organization. Student will discover a number of sophisticated tools and technique that can be applied in managing time and cost effectively on every type of project. Selected project management tools/software will be introduces during the lab session to grant student with necessary knowledge and skills in dealing with stages of the project life cycle, how to work within organizational and cost constraints, manage resource and project team effectively.

#### Course Outcome

CO1 Explain the concept of project planning and organization.  
CO2 Apply appropriate techniques for Project Monitoring and control, Network Diagrams, Resource Estimation for small construction project.  
CO3 Demonstrate the ability of using Project Management software in managing small scale project.

BET2334  
Infrastructural Project (Studio 3)  
Credit: 4  
Prerequisites: BUM1223 & BET1474

#### Synopsis

This course will introduce students to the use of principal analysis in statically determinate and indeterminate structures. It includes the analysis of internal forces, deflection and calculation of vertical reaction, shear force,

moment of plane static model. At the end of this course, students should be able to perform basic structural analysis of typical structure of beam and frames, and trusses.

#### Course Outcome

CO 1 Explain the elements of plane statics and determinacy of structures.  
CO2 Analyse the support reactions, forces and moments in common infrastructural components.  
CO3 Investigate the response of common infrastructural components under specified loading conditions.  
CO4 Apply appropriate techniques and tools asses the response of infrastructural components under loads.

BET3583  
Urban Infrastructure  
Credit: 3  
Prerequisites: BET1114

#### Synopsis

This course is designed for persons who work in the built environment. This course will expose students to the understanding of how infrastructure systems are planned, designed and operated. Students will be introduced to emergent behavior and transitional strategies including the competing technical, economic, social, environmental and community dimensions in the urban strategy development. In addition, students will be exposed to the concept of sustainability and universal design as adding skills in developing and analyzing urban transitional strategies for a particular infrastructure component.

#### Course Outcome

CO1 Explain the principles of infrastructure planning in urban areas.  
CO2 Demonstrate solutions on issues concerning infrastructure in urban areas.

BET2492  
Construction Safety  
Credit: 2

Prerequisites: None

### Synopsis

This course is designed for persons who work in the construction industry. This course will provide all members with greater safety in construction field particularly referred to construction safety awareness. It is also designed to increase their confidence in the action to take in case of any emergencies. The stages of construction and most of the building process within the life cycle of a building will be elaborated. All the relevant document and acts particularly relating to Malaysia scenario are among the important references that will be discussed along with the sequence of building construction. Building materials Students are expected to venture into a general safe working practices at construction site and able to supervise the total environment as a free accident area.

### Course Outcome

CO1 Recognize the local Act and regulations related to construction safety.  
 CO2 Identify the hazardous materials, substances and unsafe practices at construction industry.  
 CO3 Assess the level of risk and safety of work places compliance to the national safety regulation.  
 CO4 Outline a proposal to enhance and increases a safer work practices in construction industries.

BET2483

Problem Solving and Analysis

Credit: 3

Prerequisites: None

### Synopsis

This course will increase a student's ability to work as part of an engineering team. It presents a range of engineering theory and applications through engineering design concepts that are learnt within the context of solving a real world problem. This course focuses primarily on the use of statistical analysis to analyse data, propose solutions,

solve problems and evaluate possible solutions. In addition the student is required to further develop their computer skills (especially Excel) to analyse statistics, illustrate and present the results of their work.

### Course Outcome

CO1 Explain engineering problem and analysis in industry application.  
 CO2 Demonstrate the ability to use of spreadsheet program for data analysis.  
 CO3 Communicate the preparation, execution and presentation of problem solving and analysis assigned effectively.

BET1263

Geology and Geomechanics

Credit: 3

Prerequisites: None

### Synopsis

This course introduces the basic mechanics of geomaterials for geotechnical engineering purposes. It covers basic geomaterials formation and its characteristics. The engineering behaviour soil in relation to compaction, seepage, consolidation, settlement and stability of slope are covered in this course.

### Course Outcome

CO1 Describe the formation of geomaterials and its characteristics which influence their engineering technology application.  
 CO2 Use principles of mechanics in solving problems related to soil compaction, seepage, effective stress and slope stability.  
 CO3 Analyse settlement magnitude and stability related to consolidation and loading condition of shallow foundation in engineering work.

BET2344

Infrastructure Planning (Studio 4)

Credit: 4

Prerequisites: BET2413 & BET2334

### Synopsis

This is a practical-based course that covers the application of basic project scheduling skills and knowledge. Students are exposed to current industry practice on managing infrastructure projects through industry guest lectures and site visits. Case studies and example of real-life projects are brought to the class to enhance student knowledge on overall project planning. Students are required to perform hands-on project planning exercises by using planning softwares in the laboratory sessions.

#### Course Outcome

CO1 Describe the process involved in project integration management and project scope management for infrastructure projects.  
 CO2 Determine the components/aspects involved in infrastructure project planning based on real-life projects.  
 CO3 Make use of project planning softwares and relevant tools to develop project planning documents.  
 CO4 Develop a Masterworks Programme for a small-scale infrastructure project.

#### BET2422

Financial Management for Decision Making  
 Credit: 2  
 Prerequisites: None

#### Synopsis

This course is to develop thinking in financial management concepts. This will enable student to understand how organisation in construction industry make important investment and financial decisions. This course will help any future technologist to understand how the finances of a company work, and how they will be interfacing with finance and decision making in a project.

#### Course Outcome

CO1 Describe concepts and theories in financial management.  
 CO2 Apply concepts and theories of financial management in making financial decisions.  
 CO3 Discuss issues in financial

management that stimulate decision making skills.

#### BET2373

Construction Engineering  
 Credit: 3  
 Prerequisites: None

#### Synopsis

This course intends to introduce the student to the world of construction industry including the common materials used in construction particularly on reinforced concrete. It is also encompassed the broad quality aspect of materials used in reinforced concrete and hardened concrete testing related for quality control. For each material, the module described the manufacturing process and physical properties with the aims of ensuring their appropriate application within the awareness of sustainability impact to construction industry. Furthermore, this module introduced the fundamental knowledge of construction works and latest technology applied in construction industry which will contribute to the development of a strong and stable structure. Student will undergo a series of continuous assessment such as quiz, assignments, tests and a project to ascertain the learning outcomes of the module are achieved.

#### Course Outcome

CO1 Discuss the commonly used materials and quality control in construction works.  
 CO2 Explain about construction engineering, the responsibilities of parties involved in construction project and construction work process.  
 CO3 Explain the sustainability aspect in construction work that includes temporary work structure and equipment, sub-structure and superstructure.

#### BET1413

Engineering Practice 2  
 Credit:3  
 Prerequisites: None



### Synopsis

This course involves practice modules covering aspects of geological, soil & highway materials tests according to Malaysian Standards in order to gauge various engineering properties of the materials. Practice requirements include laboratory work in a team environment, site study and the preparation of reports. The experiments are complementary to the theories that students have learned in the classroom. The site study provides the student with real case situation that expose them to the practical work at the construction industry.

### Course Outcome

CO1 Discuss the fundamental and theories of geological, soil and highway materials properties that related to civil engineering works.

CO2 Conduct experimental investigations for general suitability of site construction using primary and/or secondary data from relevant sources.

CO3 Demonstrate practical skills through laboratory test for the materials properties involved in site construction.

CO4 Interact professionally in interpreting laboratory experimental data with fundamental theories related to site construction materials properties.

BET 3582

Digital Construction Technology

Credit: 2

Prerequisites: None

### Synopsis

This course discusses selected technology related to software and hardware application in construction industry. The students will be introduced the latest technology used in construction field related to in design engineering, construction and operational management. At the end of study, student is expected able to produce and analyses the small-scale engineering model adopting the latest technology.

### Course Outcome

CO1 Able to demonstrate the latest hardware and software technology in infrastructure management.

CO2 Conduct the standardized engineering analysis adopting latest technology.

BET3573

Building Facilities and Maintenance

Credit: 3

Prerequisites: None

### Synopsis

This course is to develop thinking facilities management concepts. The course aims to provide students the knowledge concerning building facilities and maintenance, as well as their applications in the facilities management. The silibus is to view out of an organisation's primary operations, taking an integrated view of the building facilities and maintenance also others infrastructure services and use it to give building owner satisfaction and value for money through support for an enhancement of the core business.

### Course Outcome

CO1: Describe the process of building facilities and maintenance.

CO2: Develop understanding of facilities and maintenance functions of building facilities.

CO3: Discuss the issue in building facilities and maintenance.

BET4222

Technologist in Society and Law

Credit: 2

Prerequisites: None

### Synopsis

This course introduce students to activities as engineering technology students, career guidance as graduate in engineering technology, professional bodies and society of engineering technology, law and ethical conducts governing engineering technologist, route to be a professional in the field, and preparation of of CV as graduate in civil engineering technology.

### Course Outcome

CO1 Interpret or predict consequences or outcomes based on current and future behaviors or actions by certain parties and individuals.

CO2 Adapt to an understanding of professional ethics, responsibilities and norms of engineering technology practices.

### BET2573

Construction Methods

Credit: 3

Prerequisites: BET2373

### Synopsis

This course will introduce students to the current practice of construction methods applied in the infrastructural projects. The course is a continuity of construction engineering course and focuses more into the applied theory of particular study case. The construction progress covers the area of site preparation, substructure, superstructure, mechanical & electrical, and utilities.

### Course Outcome

CO1 Explain the scope of works for site preparation in the construction project.

CO2 Evaluate the requirement of sub-structure, superstructure and utilities work in a project.

CO3 Recommend the suitable construction method for a construction project.

### BET4042

Entrepreneurship for Technologists

Credit: 2

Prerequisites: None

### Synopsis

Application of technology in entrepreneurship civil engineering technology project with reference to prevailing standards. Cost Benefit Analysis as key to determine project feasibility and viability.

### Course Outcome

CO1 Prepare project proposal for civil engineering technology project.

CO2 Produce design, cost estimate and cost benefit of the project.

### BET3634

Infrastructural Design (Studio 5)

Credit: 4

Prerequisites: BET1303 & BET2344

### Synopsis

This course attempts to explain the fundamental aspects of design skills necessary in the development of an infrastructure project. Major aspects that are covered throughout the course includes design of basic infrastructure and project reporting. Case studies and hands-on projects are introduced to students to enhance their knowledge in designing on ground infrastructural facilities.

### Course Outcome

CO1 Determination of the original ground level using mass haul diagram.

CO2 Analysis of geotechnical investigation to develop a foundation and embankment for infrastructure.

CO3 Analysis and demonstrates problem related to earth retaining structures.

CO4 Analysis of geotechnical investigation to develop a foundation and embankment for infrastructure.

### BET3683

Final Year Project 1

Credit:

Prerequisites: BUM2413

### Synopsis

This course is designed to expose the students to a senior design project. They have to apply all the knowledge that they have learned in the programme to complete the senior design project. Each student will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor). During the senior design project I, the

students will be able to do a literature survey and prepare a draft which contains objective of the project, problem statement, literature survey, solving techniques, methodology, expected result, treatment of results and list of reference publications. At the end of this subject, the students are required to present the draft in a short seminar which will be evaluated by a faculty's panel.

#### Course Outcome

CO1 Propose background study, problem statement, objective and scopes of the research.

CO2 Practice positive attitude and ethics in research activities.

CO3 Present the research proposal and cited latest publications on the subject.

#### BET3644

Infrastructure Management (Studio 6)

Credit: 4

Prerequisites: BET3634

#### Synopsis

The course is the continuation of Infrastructural Project (Studio 5) in which students conduct infrastructural design, project BQ and cost estimation, project report and engineering drawing for a selected town with a selected theme. Although the project is in conducted in group, students are expected to demonstrate individual values in term CTPS, TPS, CS and LS.

#### Course Outcome

CO1 Communicate effectively in a team and with external parties.

CO2 Develop professional and ethical responsibilities.

CO3 Select sustainable practices in the conduct of the project.

CO4 Make appropriate references to the code of practice/guidelines.

CO5 Demonstrate techniques/skills using modern engineering tools.

#### BET3593

Quality Performance Management

Credit: 3

Prerequisites: None

#### Synopsis

This course mainly covers several topics related to quality and performance management, namely different systems used for assessing quality of infrastructure projects, methods of assessing overall construction project performance as well as different techniques applied in establishing and maintaining quality of infrastructure projects. Case studies and project-based tasks are introduced to understand the application of quality and performance in infrastructure projects.

#### Course Outcome

CO1 Understand the fundamental concept of quality and performance in infrastructure projects.

CO2 Identify different types of quality management systems suitable for infrastructure projects.

CO3 Analyze production planning, control and inventory management activities based on given cases.

CO4 Evaluate solutions for a given cases based on total quality management systems, quality control concept ISO 17001.

#### BET1613

Engineering Practice 3

Credit: 3

Prerequisites: BET1413 & BET2373

#### Synopsis

This course will involve the student in an investigation of the range of materials commonly used in civil engineering. The characterization of materials and the need for material parameters for design will be considered. The student will test a range of materials in the laboratory to establish material properties. Presentation and interpretation of test results will also form an important part of the course.

### Course Outcome

CO1 Demonstrate characteristics of materials commonly used in engineering are important in civil engineering design and construction.

CO2 Describe how key characteristics of civil engineering materials are quantified.

CO3 Plan the test regime used to ascertain design parameters for civil engineering materials.

CO4 Organize a testing procedure and sequence to obtain parameters for civil engineering design purpose.

CO5 Analyse test data and present the data and its analysis for use by other engineering personnel.

### BET3513

Conflict and Risk Management

Credit: 3

Prerequisites: None

### Synopsis

The course will introduce students to the nature and causes of conflicts and risk management. Students will understand functions, strategies, and skills of negotiation. The course aims to guide students understand different types of theories of conflict escalation and management. It will enlighten students understand the relationships among power, rights and interests in the process of dispute resolution. A risk management is a problem analysis in a project. The principles, providing a risk methodology for the management of risk and highlighting where different treatment is needed according to the nature of a particular risk.

### Course Outcome

CO1 Understanding concept of conflict and risk management.

CO2 Discuss the process of conflict and risk management issues.

CO3 Evaluate the issues of conflict resolution and risk management.

### BET3522

Procurement for Infrastructural Project

Credit: 2

Prerequisites: None

### Synopsis

The course is designed to provide students with fundamental concepts and techniques for project acquisition and procurement. Student will learn procurement process and expected to develop an in-depth understanding of project evaluation, planning, financing, contracting, negotiation, and procurement execution.

### Course Outcome

CO1 Discuss the importance of procurement in construction project.

CO2 Differentiate different types of procurements and payment methods in construction.

CO3 Analyse case studies on different procurement models in variety construction projects.

### BET4783

Final Year Project 2

Credit: 3

Prerequisites: BET3683

### Synopsis

This module intends to introduce the student to the world of research including the research methods, writing a technical report, and presenting the project. It is also encompassed the broad quality aspect of preparing the technical paper (extended abstract) and a research competition quality video for presentation. For each research project, students will have guidance from supervisors with the aims of ensuring their appropriate research project within the awareness of the current field needed by the industry. Furthermore, this module introduced the fundamental knowledge of designing the experimental works and writing a technical paper in which will prepare the student for the research and development field. The student will undergo a series of continuous

assessments such as submitting the technical paper, progress report, logbook, project report, and presentation to ascertain the learning outcomes of the module are achieved.

#### Course Outcome

CO1 Analyze data, discuss and conclude the findings.

CO2 Manage the research work.

CO3 Practice positive attitude and ethics in research activities.

CO4 Compliance to industrial ethical conduct.

BET4774

Technology Design Project

Credit: 4

Prerequisites: BET3644

#### Synopsis

This course is the integration of all Studio subjects where student will learn to apply all infrastructural fundamental design in the given case study. Design aspect will cover the infrastructural basic designs and optimised with application of selected green technologies. Appropriate construction method, operation and maintenance requirements have to be recommended. Consultation with experts, authorities, consultant and contractors should also be sought out.

#### Course Outcome

CO1 Investigate the roots of a problem to a civil engineering infrastructure significance project individually and in group.

CO2 Propose solution to the project by conducting basic design process that conform to prevailing standards.

CO3 Enhance the project design with application of appropriate green technologies.

CO4 Present project ideas, design and final products orally and in written formats.

**CURRICULUM STRUCTURE  
DIPLOMA IN CIVIL ENGINEERING**

YEAR	1						2		3
	FIRST	SECOND	THIRD	FORTH	FIFTH	SIXTH			
SEMESTER	UHC2022 Penghayatan Etika dan Peradaban	DRA1113 Engineering Mechanics	DRA1123 Mechanics of Materials	DRA1133 Theory of Structures	DRA2023 Project Management	DRA2910 Industrial Training			
	UHL2442 Essential English	DRA1713 Fluid Mechanics	DRA1613 Environmental Engineering	DRA2413 Traffic and Highway Engineering	DRA2213 Structural Design 1 (Concrete)				
	DUF1113 Physics	DRA1312 Engineering Materials	DRA1913 Engineering Surveying	DRA1513 Soil Mechanics and Geology	DRA2223 Structural Design 2 (Steel and Timber)				
	DUM1113 Basic Mathematics	DRA1012 Engineering Drawing	DRA2922 Engineering Surveying Fieldwork	DRA1723 Hydraulics and Hydrology	DRA2523 Geotechnical Engineering				
		UHS1022 Softskills	Engineering Laboratory I (Water and Environment)	DRA2821 Engineering Laboratory II (Materials and Structural)	Engineering Laboratory III (Geotechnical And Highway)				
		DUM1123 Calculus	UGE1002 Entrepreneurship	DUM2143 Advanced Calculus	DRA2844 Civil Engineering Final Project				
		UHL2412 English for Academic Communication	UHC1012 Falsafah dan Isu Semasa	UQB1**2 Co-Curriculum					
			UHL2432 English for Professional Communication						
TOTAL CREDIT PER SEMESTER	10	17	18	18	17	10			
<b>OVERALL TOTAL CREDIT FOR GRADUATION</b>									
<b>90</b>									

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Competent : Apply knowledge to produce an acceptable quality of works in the field of civil engineering and technology.
PEO2	Professionally attached to work place and the societies : Contribute as skillful assistant/associate Civil Engineers with desires to grow intellectually and professionally within local and global working environment.
PEO3	Lifelong learning : Stay inform and adapt to emerging technologies, contemporary issues and future challenges in career with professionalism, ethical and high integrity.

**PROGRAMME LEARNING OUTCOMES (PLO)**

PLO1	Knowledge – Apply knowledge of applied mathematics, applied science, and civil engineering fundamentals and engineering specialisation to wide practical procedures and practices.
PLO2	Problem Analysis – Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to civil engineering field.
PLO3	Design / development of solutions – Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
PLO4	Investigation – Conduct investigations of well-defined problems, locate and search relevant codes and catalogues, conduct standard tests and measurements.
PLO5	Modern Tool Usage – Apply appropriate techniques, resources or modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations.
PLO6	The Engineer and Society – Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice and solutions to well-defined engineering problems.
PLO7	Environment and sustainability – Understand and evaluate the sustainability and impact of engineering technician practices in the solution of well-defined engineering problems in societal and environmental contexts.
PLO8	Ethics – Understand and commit to professional ethics, responsibilities and norms of engineering technician practices.
PLO9	Individual and Teamwork – Function effectively as an individual, and as a member in diverse technical teams.
PLO10	Communications – Communicate effectively on well-defined engineering activities with the engineering community and society at large.
PLO11	Project Management and Finance – Demonstrate knowledge and understanding of engineering management principles, as a member or leader in a technical team and to manage projects in multidisciplinary environments.
PLO12	Lifelong Learning – Recognise the need for, and have the ability to engage in independent updating in the context of specialised technical knowledge.

## **COURSE SYNOPSIS**

### **DIPLOMA IN CIVIL ENGINEERING**

DRA1012  
Engineering Drawing  
Credit Hour: 2

#### Synopsis

This subject aims to expose civil engineering students to engineering drawing and to prepare this knowledge in their future profession. This includes the structural, section and structural detailing drawings. Hands-on sessions using drawing software packages will equip the students with first hand practice on producing the drawings for some idealized and actual projects. Mini project covers several disciplines of civil engineering profession integrated through a series of these hands-on sessions.

#### Course Outcome

At the end of semester, student should be able to:

- CO1: Interpret the actual construction civil engineering drawings.
- CO2: Execute computer-aided software to produce engineering drawing.
- CO3: Demonstrate the ability to lead and productively participate in group situations.

DRA1312  
Engineering Materials  
Credit Hour: 2

#### Synopsis

This course will enable students to demonstrate understanding in the fundamental properties of construction material. Students will learn the basic properties of cement, aggregate, water, admixtures, manufacturing of concrete, masonry, timbers, metals, and other construction materials. At the end of the course students should be able to identify the suitability of each material in a construction, analyse and provide basic solution to the problematic material, and recognize the importance of sustainability practice in construction material.

#### Course Outcome

At the end of semester, student should be able to:

- CO1: Identify properties and the suitability of material in civil construction.
- CO2: Analyze and provide solutions to the problematic material in civil construction.
- CO3: Describe how the concept of sustainability applies to construction materials.

DRA1113  
Engineering Mechanics  
Credit Hour: 3

#### Synopsis

The emphasis on the development and correct application of the fundamental concepts of rigid body mechanics. Topics covered for both statics & dynamics are force system resultants, condition of equilibrium, centroid & moment of inertia; force & acceleration and work & energy.

#### Course Outcome

At the end of semester, student should be able to:

- CO1: Describe the concept of static and dynamic mechanics system in engineering applications.
- CO2: Analyze the concept of static mechanics system which studies the effects and distribution of forces of rigid bodies at equilibrium condition.
- CO3: Analyze the concept of dynamic mechanics system which studies the effects and distribution of forces of rigid bodies at equilibrium condition.

DRA1713  
Fluid Mechanics  
Credit Hour: 3

#### Synopsis

To introduce the fundamental principles of fluids mechanics, the basic equations governing fluid statics and fluid flow and the methods of solving engineering problems



related to Fluid Mechanics.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Estimate the fluid mechanics problem using the fundamentals of Fluid Mechanics concept related to Newton's laws, Hydrostatic Law & Bernoulli equation.

CO2: Apply the Bernoulli's Principles & Continuity Law in pipeline system.

#### DRA1123

Mechanics of Materials

Credit Hour: 3

#### Synopsis

This course provides students with the understanding and fundamental concepts about the performance of deformable solids in various materials under a variety of loadings conditions. Thus, the main objectives of the course covers the determination of stresses, strains, elastic behavior of materials and deformation suffered by structural members subjected to tension, compression, torsion, bending, both individually and in combination. This course also concerned with the calculation of shear force, bending moment and stresses in beam under loads. The calculation of internal stresses and strains through the application of stress transformation equations and Mohr's circle are presented.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Identify the fundamental concepts of stresses, strains and its relationship in structural member subjected to loadings and torsion.

CO2: Determine the stresses, strains and its relationship in axially loaded member, in-plane member and circular torsion member subjected to loadings.

CO3: Determine the shear force, bending moment and shear-bending diagrams by using shear-moment equations and semi-graphical method as well as stresses in

beams subjected to flexural loadings.

#### DRA1613

Environmental Engineering

Credit Hour: 3

#### Synopsis

This course is an introduction to the different aspects of environmental engineering. The course outline is divided into six main topics: water quality, water treatment engineering, wastewater treatment engineering, water pollution, air pollution and solid waste management in which contemporary issues and principles of sustainable development are highlighted.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Determine the major concept and relevant calculation related to the water quality parameters, water and air pollution as well as solid waste management.

CO2: Solve the unit operations specific to water and wastewater treatment processes.

CO3: Propose solution for environmental problem that aims to promote environmental sustainability.

#### DRA1913

Engineering Surveying

Credit Hour: 3

#### Synopsis

This subject will expose to the civil engineering students the role of survey engineering in their field. The subject topics encompasses introduction to the engineering surveying, surveying equipment, measurement unit, bearing/angle and distance measurement for horizontal control, coordinate system, area & volume calculation, mass transfer diagram & mass transfer measure and the final setting out for construction work.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Apply the principle of engineering survey including the engineering surveying roles in civil engineering works [i.e: Solve the point location, coordinate system, read and understand the information shown in site plan].

CO2: Outline the procedure to perform horizontal and vertical control based on related provision i.e theodolite, traversing and leveling [angle, horizontal distance and vertical distance measurement and cogo computation.

CO3: Analyze the range of calculations that can be made with surveying data i.e An ability to make a necessary calculation to fix position of forming a horizontal and vertical curve, area and volume of construction work project.

DRA2922

Engineering Surveying Fieldwork

Credit Hour: 2

#### Synopsis

This fieldwork emphasizes on handling of survey equipments, carry out linear survey, traverse survey, leveling, establishing temporary bench mark, detail survey, techniques of gathering the locating man-made and natural features, preparation of site plan, related computation, and setting-out simple construction work.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Establish a small survey works for project.

CO2: Practice the significant of survey work using engineering survey techniques based on related provision.

CO3: Demonstrate various survey instruments at site.

DRA2811

Engineering Laboratory I  
(Water and Environment)

Credit Hour: 1

#### Synopsis

Engineering Laboratory I (Water and

Environment) I for diploma covers laboratory experiments in the field of Water and Environment. The laboratory experiments are complementary to the theory that students have learnt in their classrooms and will expose them to the practical work in the working industry.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Apply experiment data using significant and limitations of properties based on related standard requirement as well as use communication skills to transfer their findings in a formal report format.

CO2: Interact professionally among themselves and able to conduct laboratory tests.

DRA1133

Theory of Structures

Credit hour: 3

#### Synopsis

In this course, students will be introduced to the fundamental concepts of stability and determinacy of structures. It deals with the analysis of statically determinate and indeterminate structures. For statically determinate structures, it consists of beams, trusses and arches. The analysis covered on the several methods to calculate the slope and displacement of beams and trusses by using various of methods. The internal forces of truss members and arches under static loads are also determined. For beam and truss under moving loads, the influence lines of shear and moment are examined. On the other hand, the end moments in members for statically indeterminate beams and frames (non-sway and sway frames) were also analyzed by using slope deflection method and moment distribution method.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Identify the stability and determinacy of structures and the fundamental of analysis.

CO2: Determine the slope, deflection and internal forces by using different methods as well as influence lines due to moving loads for statically determinate beams and trusses.

CO3: Determine the end moments by using various methods and shear-moment diagrams for statically indeterminate beams and frames.

DRA1513

Soil Mechanics and Geology

Credit Hour: 3

#### Synopsis

Soil mechanics provides students with a basic knowledge of the fundamental concepts of soil behavior and gives an introduction into general geotechnical engineering. The course describes the relationship between soils and its geological origins and demonstrates the significance of the particles size distribution and mineralogy; soil description; phase relationship; classification of soil; compaction of soil; soil permeability and principle of effective stress; stress distribution.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Use science and mathematical knowledge to determine soil's basic properties and the classification.

CO2: Solve soil mechanics problems by using the principle related to soil's compaction, seepage and stresses.

DRA1723

Hydraulics and Hydrology

Credit Hour: 3

#### Synopsis

Hydraulics introduces the basic concepts of fluid flow in open channel including uniform flow, non-uniform flow and hydraulic jump. Water distribution through pipeline and hydraulic machinery, especially pumps are covered in this course. Whilst hydrology includes the hydrological cycle, precipitation, measurement and analysis of rainfall, hydrological losses, streamflow, runoff, hydrograph and groundwater.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Compute the water distribution system using Hardy Cross and Node method.

CO2: Solve problems related to hydrological processes using areal precipitation, Horton equation, and Unit Hydrograph (UH) method.

CO3: Examine the hydraulics open channel system using Manning's Equation, Froude Number and open channel cross-sectional table and design chart.

DRA2821

Engineering Laboratory II  
(Materials and Structural)

Credit Hour: 1

#### Synopsis

Engineering laboratory II (Materials and Structural) covers most of the important experiments related to material and structural testing. The experiments are complimentary to the theory that students have learned in the classroom and also to expose them to the practice work at the construction industry.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Collect, analyze, interpret and conduct experiments from mix design, destructive, non-destructive and light structure tests based on related standard requirement as well as use communication skills to transfer their findings in a formal report format.

CO2: Interact professionally among themselves and able to conduct laboratory tests.

DRA2831

Engineering Laboratory III  
(Geotechnical and Highway)

Credit Hour: 1

#### Synopsis

This Engineering Lab III (Geotechnical and Highway) covers Highway and Geotechnical

laboratory testing. The experiments are complimentary to the theory that students have learned in the classroom and also to expose them to the practical work in the construction industry.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Able to apply, collect, analyze, interpret experimental data and use significant and limitations of properties based on related standards as well as use communication skills to transfer their findings in a formal report format.

CO2: Interact professionally among themselves and able to conduct laboratory tests.

#### DRA2413

Traffic & Highway Engineering  
Credit Hour: 3

#### Synopsis

This course is designed to introduce students on the basic understanding of highway & traffic engineering with an emphasis on the design standards that being used in Malaysia. Topic covers are Malaysian Road Network, Traffic Engineering Studies which includes fundamentals principles of speed and volume studies, Traffic Signal System, Road Geometric Design, Pavement Design and Materials and Pavement Maintenance and Rehabilitation.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Explain the fundamental principles and important components in highway and traffic engineering.

CO2: Analyse the data collection of traffic studies and traffic control system at intersection based on JKR standard.

CO3: Apply knowledge of basic elements in Highway Geometric Design, Pavement Design and materials based on JKR Standard and their maintenance & rehabilitation.

#### DRA2023

Project Management  
Credit Hour: 3

#### Synopsis

To introduce the concept of project management which will provide the students with the knowledge of managing of construction project. As an introduction, students will be given general information on basic elements involved in management and phases in construction project. Then they will be given exposure to the methods to properly plan and schedule the project plus knowledge to do cost estimation of the construction project.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Demonstrate the concept of Project Management to plan and implement projects using network analysis tools for managing time as well as identify cost and quantities of materials using SMM method.

CO2: Operate MS Project in performing the project planning and scheduling tasks.

CO3: Demonstrate the ability to lead and productively participate in group activity.

#### DRA2213

Structural Design I (Concrete)  
Credit Hour: 3

#### Synopsis

This module is intended to give students a good understanding of the design and behaviour of reinforced concrete structures at the design ultimate limit state. We will look at the design of building structures in some detail with particular emphasis on the design of beams, slabs, columns and staircase. Emphasis is placed on understanding structural behaviour and the background to the design methods in EC2 and other codes where appropriate. By the end of this module student will have a good understanding of the design and behaviour of reinforced concrete beams, slabs, columns and staircases.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Explain the basic concepts of reinforced concrete design and load involved in structural design. Analysis first principle for single and double reinforced concrete beam.

CO2: Design reinforced concrete beam, slab, column and staircase by using relevant codes of practice and carry out the concrete structures detail.

CO3: Construct structural drawing using AutoCAD based on the architectural drawing. Then, design a two-storey building project in accordance to design code standards.

#### DRA2223

##### Structural Design II

Credit Hour: 3

#### Synopsis

This course covers the analysis and design steel structures to EC3 for beams, column, connections, trusses, compression members and tension members. This course has also covered an introduction and design to the timber structure included the design of the compression and tension timber members structure based on the MS544.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Classify the steel and timber structures according to the relevant codes of practice in building design.

CO2: Design the steel and timber structure members according to the relevant codes of practice in building design.

CO3: Communicate effectively within a team designing to an industrial building/canopy to produces a report and present the project according to a given time.

#### DRA2523

##### Geotechnical Engineering

Credit Hour: 3

#### Synopsis

This subject provides further discussion and explanation related to soil engineering. The

broad topics covered in the subjects include the shear strength of soil, lateral earth pressure, bearing capacity of soil, site investigation, slope stability, compressibility of soil and environmental geotechnics. At the end of this course, students should have sufficient exposure regarding soil engineering and behaviour and also able to relate the fundamentals to real practice.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Use various approach to solve geotechnical problems related to shear strength, lateral earth pressure and bearing capacity.

CO2: Use various method of analysis to analyze slope and settlement problems.

CO3: Interpret information from site investigation report to produce soil profiling.

#### DRA2844

##### Civil Engineering Final Project

Credit Hour: 4

#### Synopsis

This course covers knowledge and display practice skills in civil engineering. The student also exposed in communication skills, group works, work planning, decision making, recommendation and creativity using available facilities. Student will undergo a series of continuous assessment such as proposal presentation, project presentation, and report to ascertain the learning outcomes of the subject are achieved.

#### Course Outcome

At the end of semester, student should be able to:

CO1: Design the process of investigation and propose an engineering-based project with clear and concise manner.

CO2: Determine the findings and conclusion of the project through a series of data collection and analysis using civil engineering technology tools and apparatus.

CO3: Practice positive attitude in research activities.

CO4: Demonstrate the compliance of the

project to industrial ethical conduct.

DRA2910  
Industrial Training  
Credit Hour: 10

### Synopsis

This course involves placement of students in relevant industry for approximate 24 weeks duration to get real-world working experience. Every student will be assigned an advisor/lecturer from the faculty who will co-operate with the industrial counterpart. At the end of the industrial training, students need to submit report. In addition, the respective industrial counterpart need to evaluate and provide comments on the students performances. CIDB structured module will be used as a part of evaluation.

### Course Outcome

At the end of semester, student should be able to:

CO1: Behave according to organisations regulation and procedures while performing to basic professional skill during the available duration.

CO2: Practice and contribute taught theories to solve real time problem through involvement in various scopes of works such as planning concept, design, construction & project administration.

CO3: Adjust to professional and quality work ethics in order to become an effective, motivated and responsible engineer.

CO4: Communicate effectively on complex civil engineering activities such as being able to comprehend and write effective reports and design documentation and make effective presentations.



# **FACULTY OF MECHANICAL AND AUTOMOTIVE ENGINEERING TECHNOLOGY**

**COURSE INFORMATION 2022-2023**

## CURRICULUM STRUCTURE BACHELOR OF AUTOMOTIVE ENGINEERING WITH HONOURS

YEAR	FIRST			SECOND			THIRD			FOURTH			FIFTH
	FIRST	SECOND	THIRD	FIRST	SECOND	THIRD	FIRST	SECOND	THIRD	FIRST	SECOND	FIRST	
COURSES	BHA1113 Engineering Materials	BHA1413 Fundamentals Electrical Engineering 1		BHA1133 Dynamics	BHA3342 Technical Informatics 2		BHA3413 Fundamentals Electrical Engineering 2	BHA3402 Vehicle Electronics	BHA3912 Internship	BHA3011 Quality Management	BHA3313 Signals and Systems		
	BHA1103 Statics	BHA2123 Mechanics of Materials		BHA2342 Technical Informatics 1	BHA2403 Manufacturing Processes		BHA2313 Microcomputer Technology	BHA3323 Automatic Control	BHA3931 Internship Follow-up	BHA4223 Energy Efficient Vehicle	BHA4902 Preparations for Bachelor Thesis		
	BHA1602 Technical Drawing	BHA2612 Computer Aided Design		BHA2613 Machine Elements	BHA2533 Fluid Mechanics		BHA3523 Mechanical Vibrations	BHA4224 Automotive Engineering		BHA4704 Team Oriented Project Study	BHA4904 Bachelor Thesis		
	BHA1801 Experimental Laboratory	BHA1421 Mechanical Laboratory		BUM2443 Applied Statistics	BHA2021 Occupational Safety & Health		BHA3602 Automotive Product Development	BHA3533 Thermodynamics and Heat Transfer		BHA4611 Introduction to Autonomous Driving	BHA4931 Final Examination (Viva)		
	BUM2143 Applied Calculus	BUM2153 Ordinary Differential Equations					BHA3921 Engineers and Society	BHA3302 Sensors		BHA4311 Actuators 2 ECTS			
	BHA1021 Technical Communication				UGE2002 Technopreneurship		BHA3012 Numerical Programming	BHA4**21 Specialisation 1		BHA4**23 Specialisation 3			
							BHA3922 Internship Preparation	BHA4**22 Specialisation 2		BHA4**24 Specialisation 4			
							BHA4022 Project Management						
	*Optional	UHD2313 German A1	UHD2323 German A2	UH2333 German B1.1	UHD2343 German B1.2	*UH2353 German B2.1	*UH2363 German B2.2						
TOTAL CREDIT	18	17	6	13 (*16)	13 (*16)	*6	18	18	13	14	10		
TOTAL CREDIT FOR GRADUATION	140												



**SPECIALISATION COURSES**

NO.	CODE	COURSE	CREDIT HOUR
1	BHA4712	Mechanical System Design	2
2	BHA4722	Finite Element Method 1	2
3	BHA4732	Computational Fluid Dynamics	2
4	BHA4742	Finite Element Method 2	2
<b>Total Minimum Credit of Specialisation Subjects for Graduation</b>			<b>8</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Graduates are competent, responsible and practice professionalism in the global context.
PEO2	Graduates are knowledgeable and capable to apply the evolving technology in mechanical and automotive engineering field.

**PROGRAMME OUTCOMES (PO)**

Following are the 12-PO for the degree of BHA, where by the end of the programme the students are able to:	
PO1	(Engineering knowledge) An ability to apply knowledge of mathematics, natural science, engineering fundamentals and an automotive engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems. [C]
PO2	(Problem analysis) An ability to identify, formulate, research literature and analyze complex automotive engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. (WK1 to WK4) [C].
PO3	(Design/ development of Solutions) An ability to design solutions for complex mechanical-automotive engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. (WK5) [C].
PO4	(Investigation) An ability to conduct investigations of complex problems using research-based knowledge (WK8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. [C].
PO5	(Modern tool usage) An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex automotive engineering problems, with an understanding of the limitations. (WK6) [P].
PO6	(The engineer and society) An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems. (WK7). [A]
PO7	(Environment and sustainability) An ability to understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts. (WK7) [A].
PO8	(Ethics) An ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (WK7) [A].
PO9	(Communication) An ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as being

	able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. [A].
PO10	(Individual and team work) An ability to function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. [A].
PO11	(Lifelong learning) An ability to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. [A].
PO12	(Project management and finance) An ability to demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. [A].

## COURSE SYNOPSIS

### COURSE SYNOPSIS FOR BACHELOR OF AUTOMOTIVE ENGINEERING WITH HONOURS (BHA) 2021/2022

BHA1113  
Engineering Materials  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course introduces students to the engineering materials fundamentals, including the engineering materials application, atomic bonding, crystal structure, mechanical and physical properties, corrosion mechanism, microstructural analysis, phase diagram, ferrous and non-ferrous alloys, and polymer and advance materials.

#### Course Outcome

By the end of the semester, students should be able to:

Analyse and illustrate the materials' atomic bonding and crystal structure.  
Evaluate and explain the mechanical, physical properties of engineering materials and the concept of corrosion and metal alloys microstructure, phase diagram, and heat treatment processes.  
Evaluate and explain ferrous and non-ferrous alloy microstructure strengthening mechanisms and their applications.  
Analyse the polymeric materials and advanced materials classification, structure, and properties.

BHA1103  
Statics  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

An introduction to solving engineering static problem, involving: force vector, equilibrium of particle and rigid body, friction effect on rigid body equilibrium, structural analysis, frame and machines, centroids, the centre of gravity, and moment of inertia.

#### Course Outcome

By the end of the semester, students should be able to:

Analyse equilibrium of particle and rigid body.  
Evaluate equilibrium of rigid body involve friction and structural analysis.  
Evaluate centroids and moment of inertia of composite cross-sectional area.

BHA1602  
Technical Drawing  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This course introduces technical drawing and engineering drawing base on BS 8888. It consists of basic shapes, tangencies, curves of intersection, and orthographic views, including sectioning, auxiliary view, isometric view, geometric dimensioning and tolerancing, and detail assembly drawings.

#### Course Outcome

By the end of the semester, students should be able to:

Analyse tangencies, basic shapes, and sketching of engineering components.  
Evaluate orthographic view and sectional view with dimensioning.  
Analyse auxiliary view, curve of intersection and isometric drawing.  
Analyse knowledge to use for geometric dimensioning and tolerancing and assembly drawing with Bill of Materials.

BHA1421  
Mechanical Laboratory  
Credit Hour: 1  
Prerequisite: None

#### Synopsis

This course will introduce students to shop safety, reading blueprint, metrology including linear measurement, angular measurement, dial indicator, gauge block and profiler

projector, and benchwork including marking out, manual sawing, filing, chiseling, drilling, tapping and grinders. Furthermore, students will be exposed to turning machines, including tools, clamping and operation, and milling machines, including cutter, mounting and operation. Emphasis is placed on the operation of lathe machines and milling machines.

#### Course Outcome

By the end of the semester, students should be able to:

Analyse appropriate techniques and procedures to operate common tools in the mechanical laboratory.

Perform appropriate techniques and procedures to operate common tools in the mechanical laboratory.

Practice reasoning informed by contextual knowledge of techniques and procedures to operate common tools in the mechanical laboratory.

Demonstrate excellent teamwork and team cooperation during performing activities in the mechanical laboratory.

#### BHA1021

Technical Communication

Credit Hour: 1

Prerequisite: None

#### Synopsis

In this course, students learn how to approach technical communication for various audiences, purposes, and contexts. The course emphasises foundations.

for creating technical communication documents used for selecting and planning a computer science project for an actual client. Course assignments will integrate written, oral, visual, electronic, and nonverbal (WOVEN) rhetorical skills to help students thrive in the modern workplace.

#### Course Outcome

By the end of the semester, students should be able to:

Evaluate the governing principles in technical communications and strategising for effective communicate within modern and global technical ecosystems.

Manipulation of the modern tools in planning, preparation and production of various technical documents serving a broad spectrum of readers and purposes with contrasting background.

Assessment of techniques in preparing and delivering the presentation materials for effective communicative outcomes among partners and shareholders.

Investigate, determine, and formulate the modern tools in technical communication as a preparation for professional career progression.

#### BHA1801

Experimental Laboratory

Credit Hour: 1

Prerequisite: None

#### Synopsis

This course includes enhancing mastery of engineering subject matter, developing scientific reasoning abilities, increasing understanding of the complexity and ambiguity of empirical work, developing practical skills, increasing understanding of the nature of engineering, cultivating interest in engineering learning, and improving teamwork abilities.

#### Course Outcome

By the end of the semester, students should be able to:

Analyse basic manual/ procedure experiment techniques.

Determine appropriate problem-solving approach according to given experiment requirement.

Evaluate the solutions within safe working habits.

Deliver the experiment outcomes individually and in teamwork.

#### BHA1413

Fundamentals Electrical Engineering 1

Credit Hour: 3

Prerequisite: None

### Synopsis

This course introduces DC resistive network analysis, AC network analysis, diodes, bipolar junction transistors (BJT), operational amplifier (op-amp) and digital logic circuits.

### Course Outcome

By the end of semester, students should be able to:

Evaluate DC resistive and AC network analysis.

Evaluate circuits involving diodes, bipolar junction transistor (BJT) and operational amplifier

Integrate solutions to solve simple logic circuits problem.

BHA2123

Mechanics of Materials

Credit Hour: 3

Prerequisite: BHA1113 Engineering Materials

### Synopsis

This course introduces the concept of stress and strain under axial, torsion, bending, and transverse shear and combined loadings in elastic structural members. Plane stress transformation is also included.

### Course Outcome

By the end of the semester, students should be able to:

Evaluate the stress and strain in structural members subjected to axial loads and torsion loads.

Evaluate the stress and strain in structural members subjected to bending loads and shear loads.

Construct stress and strain in structural members subjected to combined loads and conduct the stress transformation.

BHA2612

Computer Aided Design

Credit Hour: 2

Prerequisite: BHA1602 Technical Drawing

### Synopsis

This course introduces the types of fastener and spring types, AutoCAD, 2 – D drawing command, coordinate system, organising the drawing, AutoCAD drawing setting, Introduction to Solid Works, 3 – D solid modeling, 3 – D drawing, Blueprint drawing, 3 – D functioning and organising, Solid Works Animator.

### Course Outcome

By the end of the semester, students should be able to:

Analyse drawing information in CAD and Solid Works

Evaluate 2-D drawings using AutoCAD and 3-D solid modeling using Solidworks.

Prepares mechanical engineering parts using learned software

BHA1133

Dynamics

Credit Hour: 3

Prerequisite: BHA1103 Statics

### Synopsis

This course introduces the principles of kinematics of a particle and a planar rigid body, kinetics of a particle and a planar rigid body utilising force and acceleration method, work and energy method and impulse and momentum method.

### Course Outcome

By the end of the semester, students should be able to:

Evaluate and solve problems involving the kinematics of a particle.

Evaluate and solve problems involving kinetics of a particle utilising force and acceleration method, work and energy method and impulse and momentum method.

Create solutions involving kinematics of a planar rigid body and kinetics of a planar rigid body utilising force and acceleration.

**BHA2342**

Technical Informatics 1

Credit Hour: 2

Prerequisite: None

**Synopsis**

This course introduces input and output, variables, constants, arithmetic operations and mathematical functions, user-defined functions, selection of decision-making and repetitive construct, and array data structure. The programming language used for the course is C language.

**Course Outcome**

By the end of the semester, students should be able to:

Evaluate C program using variables, constants declarations, arithmetic operations, mathematics function, selection of decision-making involving construct and loops.

Evaluate C program using user-defined functions, numeric arrays and develop C programmes for engineering applications.

**BHA2021**

Occupational Safety & Health

Credit Hour: 1

Prerequisite: None

**Synopsis**

This course introduces OSH in Malaysia, identification, types and inspection of industrial hazard, analysis and control of industrial hazard, mechanical hazard, chemical hazard, physical hazard, psycho-social hazard, industrial hygiene, accident causation phenomenon, accident investigation and analysis, managing safety and health, and industrial safety and health regulation.

**Course Outcome**

By the end of the semester, students should be able to:

Identify OSHA regulations and its implementation in Malaysia

Analyse industrial hazards and industrial

hygiene programs

Identify causation of accident phenomenon, accident investigation and analysis

Integrates lifelong learning for safety and health management

**BHA2403**

Manufacturing Processes

Credit Hour: 3

Prerequisite: None

**Synopsis**

This course introduces the various type of manufacturing processes including metal casting processes, forming and shaping processes for metal, plastics and composites, material removal processes, joining processes and finishing processes.

**Course Outcome**

By the end of the semester, students should be able to:

Evaluate metal-casting processes and forming processes

Evaluate material removal processes and joining processes

Identify the appropriate surface technology processes for advanced applications

**BHA2533**

Fluid Mechanics

Credit Hour: 3

Prerequisite: None

**Synopsis**

After successfully completed the course, the students should have basic knowledge of one-dimensional flows of incompressible fluids, be able to evaluate the effect of flow circulation on bodies and understand energy loss in the flow process.

**Course Outcome**

By the end of the semester, students should be able to:

Describe and evaluate the basic principles and applications of various fluid conditions

discussed in Fluid Mechanics 1.  
Devise solutions for problems in fluid statics, dynamic pipe flow, flow measurement and dimensional analysis.  
Evaluate problems related to fluid mechanics

BHA2613  
Machine Elements  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

Introduction to design process. Study of static and dynamic loading resulting normal and shear stresses, principles stresses. Engineering materials, static and fatigue failure theories. Machine element design including screws, bolts, fasteners, welded joints, keys and coupling and springs.

#### Course Outcome

By the end of the semester, students should be able to:

Identify loading of the machine elements, stress and fatigue failure and to perform deformation and stress analysis to design safe machine components  
Evaluate design shafts, keys, coupling, gear and spring to meet desired specifications, mechanical elements for non-permanent joint including screws, bolts, fasteners, keys and coupling to meet desired specifications and permanent joints  
Organise and coordinate a team to design mechanical components.

BHA3602  
Automotive Product Development  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This course introduces the concept of product development process and organisations, product planning, identifying customer needs, product specifications, concept generation, concept selection, concept testing, industrial design, prototyping, patents and intellectual properties.

#### Course Outcome

By the end of the semester, students should be able to:

Evaluate product development process, organisation, planning stages, and process of identifying customer needs in product development.  
Evaluate establishing the target specification, refining the specification process and design, select and perform testing analysis.  
Display professional engineering practice in contextual knowledge.

BHA2313  
Microcomputer Technology  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course is an introduction to PLC and microcontroller. Students are exposed to input/output PLC interface, PLC programming, input/output microcontroller interface and microcontroller programming.

#### Course Outcome

By the end of the semester, students should be able to:

Evaluate input/output of PLC interfacing and PLC programming.  
Evaluate input/output of microcontroller interfacing and microcontroller programming.  
Construct actuator and signal device through programming and interfacing

BHA3012  
Numerical Programming  
Credit Hour: 2  
Prerequisite: BUM 2413 Applied Statistics

#### Synopsis

This course covers how to handle the numeric standard tools MATLAB and Simulink Solution of differential equations and modeling simple dynamic systems with MATLAB and Simulink.

#### Course Outcome

By the end of the semester, students should be able to:

Creates programmes using the numeric software MATLAB,  
Evaluate numerical programme to solve engineering-related problems and construct programmes to simulate dynamic systems

BHA3313  
Signal and Systems  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course covers topics under signals: energy and power signals, discrete-time and continuous, linear systems and convolutions, Fourier transform, complex Fourier series; signal spectral properties and bandwidth, Laplace transform and transient analysis. Emphasis is also given to transfer functions, block diagrams, baseband and pass band signals with applications to communications systems. Matlab and Simulink is used as the tool for simulation and application.

#### Course Outcome

By the end of the semester, students should be able to:

Evaluate the sampling theorem, its meaning and consequences for signal processing, understand the characteristic of stochastic signals and fundamental methods of stochastic signal analysis.

Develop description and design of analogue linear time invariant systems using appropriate tools

Characterise and design digital linear analogue linear time invariant systems using appropriate tools.

BHA3342  
Technical Informatics 2  
Credit Hour: 2  
Prerequisite: BHA 2342 Technical Informatics 1

#### Synopsis

This course cover topics under software process, software requirements, analysis, design concepts, and principles. By completing this subject, the student will be able to explain the software engineering principles and techniques that are used in developing quality software products.

#### Course Outcome

By the end of the semester, students should be able to:

Propose a broad range of concepts from software engineering, spanning all aspects the software engineering process and use of accepted software engineering terminology  
Develop a software for engineering project by applying a representative cross-section of software engineering techniques

BHA 3413  
Fundamentals Electrical Engineering 2  
Credit Hour: 3  
Prerequisite: BHA1413 Fundamentals Electrical Engineering 1

#### Synopsis

This course cover topics with comprehensive knowledge in the area of automotive mechatronics and familiarises students with both analytical and computational approaches in evaluating and designing vehicle electrical and electronics components and systems as well as future automotive electronics systems.

#### Course Outcome

Evaluate the principle of designing an electro-mechanical drive-train.

Analyse actuators, power electronics, converters, power supply and control of a vehicle with electrical and electronics equipment.

Integrate electrical and electronics signals and circuit using hardware and software

BHA3921  
Engineers and Society  
Credit Hour: 1  
Prerequisite: None

#### Synopsis



This course introduces the engineering profession, local industries sector, issues in local industries, ethics and public responsibility, engineer and law, and contract law

#### Course Outcome

By the end of the semester, students should be able to:

Apply engineering profession and code of ethics  
Analyse the issues in local industries and public responsibilities  
Explain the law which governs the engineering profession

BHA3011  
Quality Management  
Credit Hour: 1  
Prerequisite: None

#### Synopsis

This course introduces the basics of process-oriented management systems, seven quality tools that have been used for quality improvement such as check sheets, scatter diagrams, cause and effect diagram, pareto charts, flow charts, histograms and statistical process control. Besides that, students are introduced to quality management systems in the automotive industry (TS 16949), international quality standards (ISO 9000 series), and human factor engineering in quality management.

#### Course Outcome

By the end of the semester, students should be able to:

Apply key management concepts, quality and total quality management, Deming's management principles, ISO 9000, application of management tools.  
Analyse fundamental knowledge on quality control, engineering, management and basic quality tools  
Construct frequency distribution, central tendency, dispersion and population analysis by using statistical analysis method on data

BHA3302  
Sensors  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This course covers measurement and test engineering fundamentals - terms such as accuracy, resolution, linearity, reproducibility and error. Physics of different sensors frequently used in automotive applications. Influence of electromagnetic disturbance. Electronic signal processing (usually analogue electronics). Physical fundamentals and functional principles of various (electrical) actuators.

#### Course Outcome

By the end of the semester, students should be able to:

Analyse fundamentals to measurement engineering, electromagnetic compatibility (EMC) and signal conditioning.  
Analyse appropriate sensors for measuring temperature, pressure, speed magnetic fields, angle, acceleration, rotation rate and flow, and understand types of actuators and electronic motors.

BHA3323  
Automatic Control  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course introduces linear, time-invariant (LTI) control system modelling, analysis and design. The covered topics are frequency-domain modelling of mechanical, electrical and electro-mechanical systems; time response analysis, frequency response analysis, stability analysis and steady-state analysis. Control system design and analysis using PID controller technique.

#### Course Outcome

Develop basic control system concepts and illustrate the required control system into block design process.  
Develop frequency domain transfer function of

linear, time invariant (LTI) control systems for mechanical system

Develop the transient response, steady-state response and system stability of LTI control system compensators to achieve specified control system performances utilising root-locus technique.

BHA3402

Vehicle Electronics

Credit Hour: 2

Prerequisite: None

### Synopsis

This course aims to familiarise students with digital electronics basics and the foundations of the alternating current calculation. In addition, the student will learn the basic knowledge of the energy supply in the automobile, the lighting, and electrical wiring.

### Course Outcome

By the end of the semester, students should be able to:

Evaluate the fundamental theories alternating variables: Mean value, mean (root mean square) value, average absolute value and master/control superposition of sinusoidal vibrations, the meaning of the complex pointer and to perform the circuit analysis by using complex calculation. To understand simple filter circuits, to design and to build up.

Assess the function of the three - phase generator and the controller in the vehicle and apply correct term of the colour temperature and to understand the usage of different lamp (light source) as well as its functional principles

Manipulate skills to translate logical expressions into electronic circuits, build and analyse logic circuits and display simple, time-dependent variables in the frequency domain.

BHA3533

Thermodynamics and Heat Transfer

Credit Hour: 3

Prerequisite: None

### Synopsis

This course focuses on the application of thermodynamics knowledge in various engineering systems. The subject covers the review and analysis of energy, gas power cycles, vapour power cycles, refrigeration cycles, gas.

mixtures, gas-vapour mixture & air-conditioning, and combustion. This course will also focus on the primary modes of thermal energy transfer, viz., conduction, convection, and radiation are introduced with emphasis on understanding the

fundamental concepts to be used in analysing and solving real-life problems.

### Course Outcome

By the end of the semester, students should be able to:

By the end of the semester, students should be able to:

Evaluate the fundamentals of mass balance, 1st law, 2nd law of energy to identify, differentiate and solve engineering problems involving closed,

open systems and unsteady-flow processes.

Evaluate the fundamental concept of conduction, convection, and radiation heat transfer related to one-dimensional heat flow and different geometries.

Integrate design and apply the thermodynamic and heat transfer problem for application in the system of heat exchangers.

BHA3523

Mechanical Vibrations

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces fundamental of vibration, free vibration response for single, two and multi degree of Freedom, harmonically excited vibration response for single and two DOF system, vibration absorbers and isolators, whirling of shafts, basics of modal testing, balancing of rotating machines and others vibration measurement techniques.

### Course Outcome

By the end of the semester, students should

be able to:

Synthesise vibrational elements and dynamic behaviour of the mechanical systems.

Formulate the solutions to vibration problems that contain free-vibration and forced-vibration analysis of one, two and multi degree of freedom systems

Justify vibration measurement techniques, tools and methods

BHA3922

Internship Preparation

Credit Hour: 2

Prerequisite: None

Synopsis

This training exposes the students to professional skills and experience in aspects of mechanical engineering practice. The exposure will help to produce an excellent, responsible and good attitude.

Course Outcome

By the end of the semester, students should be able to:

Evaluate basic professional engineering skills at the industry level relating to the theory learned during the involvement of real problems solving such as planning, design, construction and management of the projects. Devise a practical problem that exists, identify the company or department structure and recognise the job scope of specific post in the organisation.

Integrate interpersonal skills with professional ethics to be excellent, motivated and responsible to the creator.

BHA3912

Internship

Credit Hour: 2

Prerequisite: None

Synopsis

This course is the practical task in an industrial company or related with the appropriate training for the duration of 95 days. The student involved in actual project of the

company from the fields of development, production or distribution. The projects studied by the students deal with topics from the vehicle technology and related fields and allow the practical application of the knowledge acquired at the university. It provides an insight view to the future professional life. The students are responsible to find a suitable project at the training company.

Course Outcome

By the end of semester, students should be able to:

Evaluate professional engineering skills required in the industry

Evaluate the theory that had been learned during the involvement of real problems solving such as planning, design, construction and management of the projects.

Organise practical solution for problems in companies or department and recognise the job scope of specific post in the organisation.

Integrate interpersonal skills with professional ethics to be excellent, motivated and responsible to the creator

BHA3931

Internship Follow Up

Credit Hour: 1

Prerequisite: None

Synopsis

This training exposes the students to professional skills and experience in aspect of mechanical engineering practice. The exposure will help to produce an excellent, responsible and good attitude.

Course Outcome

By the end of the semester, students should be able to:

Relates the theory that had been learned during the involvement of real problems and practice basic professional engineering skills at industry level solving such as planning, design, construction and management of the projects

Evaluate solutions to practical problems in companies or department structures and

recognise the job scope of specific post in the organisation.

**BHA3223**  
Internal Combustion Engine  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course provides the foundation understanding on the fundamental of internal combustion engine which includes the kinematics of combustion engine, the charge cycle and mixture formation in engine, the combustion process in engine, various combustion processes, such as petrol, diesel and HCCI engines. This course will also cover charging methods in internal combustion and the effect of combustion engine to the environment

#### Course Outcome

By the end of semester, students should be able to:

Construct engine performance and engine combustion design using fundamental principles of thermodynamics, construction elements and parameters.

Combining performances using knowledge from exhaust treatment, ignition, cooling and lubricant, charge cycle, combustion and mixture formation for diesel and gasoline engine, combustion engine and crank mechanism

Compiling engine performance using detail analysis to understand combustion and mixture formation for diesel engine, gas exchange process (supercharging/turbocharging)

Organising the impact of professional engineering solutions in the engine types, instrumentation and conduct the actual analysis of engines.

**BHA4223**  
Energy Efficient Vehicle  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course provides a new concept of categorising automotive technology towards the low fuel consumption, alternative and sustainable automotive system. Under the EEV definition, there are multiple approaches, technology, alternative fuels and materials, among others. In this course, some foundations of automotive highlighted and followed by the sustainability of different green technology, electrification and detail hybrid electric vehicle design, operation, construction and diagnosis.

#### Course Outcome

By the end of the semester, students should be able to:

Evaluate the evolution of automotive electrification and technology sustainability.

Analyse the design of various energy-efficient vehicle technology combination.

Summarise the architecture of different hybrid electric vehicles, safety design and influent of local policy & enforcement.

Evaluates the construction and operation mechanism for hybrid electric vehicle low voltage and high voltage systems, thus analysing its performance under different fault code driving conditions.

**BHA4224**  
Automotive Engineering  
Credit Hour: 4  
Prerequisite: None

#### Synopsis

This course provides the complete foundation and working principles on the automotive engineering which including vehicle dynamics, powertrain, auxiliary system, vehicle safety, HVAC, drivetrain, tires, suspension, steering, braking unit and active safety system. In addition, significant projects are match with fundamental topics for practical utilisation of techniques, skills and tools to solve engineering issues.

#### Course Outcome

By the end of semester, students should be able to:

Develop foundation knowledge and

parameters of vehicle dynamics analysis & calculation.

Evaluate the performance characteristic of vehicle dynamics topics under various driving circumferences

Compile and evaluate powertrain designs, engine cycles and digital engine control parameters while analysing engine testing and performance parameters.

Demonstrate understanding drivetrain designs, gear selections, traction diagram, body control and alternative powertrains.

BHA4311

Actuators

Credit Hour: 1

Prerequisite: None

Synopsis

This course provides the lecture with integrated exercise on the topic of electrical actuators in the area specific on small drives. The focus is on small powered electromagnetic actuators. It will focus on the physical basics, the functional principles, the design, and electrical control of various actuators are included. This lecture deals with the basics of electromagnetic fields, magnetic forces, electromagnets, the brushed and the brushless permanent magnet excited DC motor and its electrical control.

Course Outcome

By the end of the semester, students should be able to:

Evaluate motors and actuators for driving a mechanical or automotive system by accurately describe and use simple DC motor, brushless DC motor, stepper motors and servo motors.

Design a solution for driving electric motors in solving a mechanical or automotive problem with appropriate selection of power sources for driving the actuator circuits.

BHA4611

Introduction to Autonomous Driving

Credit Hour: 1

Prerequisite: None

Synopsis

This course provides the lecture with integrated exercise that shows the boundary conditions for development and the infrastructure of autonomous vehicles. Priority requirements in development process such as requirements engineering, testing and functional safety are taught in theory and with practical examples. In the lab exercise, the students develop and implement computer vision algorithms as they are used in autonomous Vehicles.

Course Outcome

By the end of the semester, students should be able to:

Evaluate foundation knowledge and parameters of autonomous vehicle.

Evaluate the performance characteristic of autonomous driving with computer vision algorithms.

Analyse powertrain designs, engine and digital engine control parameters while analysing the performance autonomous vehicle.

Investigate the advantages and disadvantages of developed computer vision algorithms.

BHA4704

Team Oriented Project Study

Credit Hour: 4

Prerequisite: None

Synopsis

After the students have analysed the main problem, they independently design and determine the specifications and requirements of the product. The documents are presented in form of a role play in which the participants act as another character, e.g. manager or customer, to discuss and improve the relevant documents. This mid-term presentations emulate industrial project team meetings with a fixed agenda, protocol, leadership, voting procedures, kick-off etc. They are followed by the evaluation phase which includes an assessment of the solution and problem solving as required from engineering and management principles.

After the final kick-off meeting of the team session phase, the design and manufacturing process starts. This phase is critically accompanied by more reviews and laboratory presentations. At the end of the semester, the finished product will be presented to the panel.

#### Course Outcome

By the end of semester, students should be able to:

Create model of dynamic systems  
Design dynamic systems with modern software  
Assemble proposed design and manufacturing of product.  
Create solutions to solve problems as required by engineering and management principles

BHA4022  
Project Management  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This course introduces the project management concepts in order to enhance the skills and managerial abilities and provide a holistic and integrative view of project management. The covered areas for project management are strategic management, organisation structure and culture, project management, cost estimating and budgeting and project plan.

#### Course Outcome

By the end of semester, students should be able to:

Analyse life cycle of the projects and project management organisational structures.  
Evaluate various frameworks and techniques of strategic plans of management and work breakdown structure (WBS) and project scheduling  
Construct various methods for estimating project costs and analyse the project risk management.

BHA4902  
Preparation For Bachelor Thesis Bachelor Thesis  
Credit Hour: 2  
Prerequisite:

#### Synopsis

Preparation for Bachelor thesis prepares students for real professional approach to engineering studies. It will teach students to structure/plan time and the content their final year project as well as approaches / procedure and tools for making scientific work/research. The task description and fundamental information of the bachelor thesis will be designed and structured.

#### Course Outcome

By the end of semester, students should be able to:

Evaluate project planning, design, construction and management of the project and theory that had been learned to solve the problems.  
Evaluate project solution based on project methodology.

BHA4904  
Bachelor Thesis  
Credit Hour: 4  
Prerequisite: Has passed more than 80 Credit hours

#### Synopsis

This course aims to train students to utilise their engineering knowledge and technical skill to solve an engineering problems. For this reason, the use of projects as a transport for teaching and for integration of subject area is strongly encouraged throughout the programme. Students should be capable of handling the problem independently with scientific and methodical in a given time.

#### Course Outcome

By the end of semester, students should be able to:

Devise solution to solve through project planning, design, construction and management.

Develop project solution based on project methodology.

Evaluate practical solution for problems in project through data collection, data analysis and discussion

Analyse research findings into a technical report.

BHA4931

Final Examination

Credit Hour: 1

Prerequisite: None

#### Synopsis

This course will test the mastery of the basic principles and important facts in learning content of the automotive studies and the bachelor thesis via written viva session between UMP/Company supervisor as well as HsKA supervisor.

#### Course Outcome

By the end of semester, students should be able to:

Apply related content of the lectures and bachelor thesis to show profound technical knowledge

Explains and practice communication on technical subjects

### SPECILISATION COURSES

BHA4712

Mechanical System Design

Credit Hour: 2

Prerequisite: None

#### Synopsis

The course introduces students to the conceptual mechanical systems design process which emphasises on determining the integrity of structures and machines, to design against failure. This includes project formulation, ideation, and evaluation to assess performance against the initial formulation phase. The design process incorporates cost benefit analysis with associated socio-economic and human factors, and fault analysis. System reliability

and parameters of components are analysed to determine the performance and failure chances of mechanical systems before the actual failure of the systems.

#### Course Outcome

By the end of the semester, students should be able to:

Demonstrate engineering design methodologies that can assist the creation of mechanical systems and artefacts.

Construct well-reasoned engineering requirements for a given problem or need

Explain individually and in team a systems approach to complex problems for optimal performance. The approach should solve complex mechanical systems design problems to ensure integrity, reliability and optimal performance.

BHA4722

Finite Element Method 1

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course cover introduces students to the commercial finite element software based on the tutorial and exercises provided. The students should be capable to independently work in comparable calculation tools. To complete the module, the students should be able to perform the stress analysis with the help of commercial software independently and in a team where the result should be tested based on accuracy plausibility. A comparison with the analytical solutions from the Technical Mechanics will show the advantages and disadvantages of the numerical methods.

#### Course Outcome

By the end of the semester, students should be able to:

Evaluate and perform stress analysis with the help of commercial software independently and in a team where the result should be tested based on accuracy plausibility

Evaluate and compare the analytical solutions

with Technical Mechanics and demonstrate understanding of the advantages and disadvantages of the numerical methods.

BHA4732  
Computational Fluid Dynamics  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This subject introduces the fundamental and application of simulation of fluid mechanics phenomenon and solving fluids problem via simulation. Holistic approaches of programming and commercial software are essentials towards solving, analysing and evaluating the results of fluid mechanics problem-based simulation. The objective of this subject is to provide the basic of simulation focusing on fluid problem which is from mathematical model such as Navier Stokes equation and solve it numerically with the aid of programming software. The next step is to understand and utilise commercial software to solve engineering fluid problem based on actual physical shape appearance which is more complex boundaries.

#### Course Outcome

By the end of semester, students should be able to:

Analyse the fundamental concepts of CFD and governing equations.  
Evaluate computational methods and simulation results of fluid problem

BHA4742  
Finite Element Method 2  
Credit Hour: 2  
Prerequisite: BHA Finite Element Method 1

#### Synopsis

In this course, the students are to carry out simple mechanics tasks by using finite element method where the calculation should follow the matrices calculation. At the end of the course, students should be able to interpret the result of modern finite element program and test the plausibility.

#### Course Outcome

By the end of the semester, students should be able to:

Analyse the engineering problem via finite element method which emphasis on the mathematical derivation for numerical implementation.  
Evaluate the result of modern finite element program and test the plausibility.



**CURRICULUM STRUCTURE  
BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (AUTOMOTIVE) WITH HONOURS**

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
	BTD1112 Statics	BTD1212 Product Development 1	BTD2113 Product Development 2	BTD2213 Product Development 3	BTD3114 Product Development 4	BTD3124 Product Development 5	BT A4112 Final Year Project	BT D4212 Industrial Training
	BT D1123 Engineering Materials	BT D2123 Fluid Mechanics	BT D1222 Dynamics	BT D3123 Finite Element Analysis	BT D2223 Mechanical Vibration	BT A3233 Autotronics	BT D4131 Occupational Safety and Health	
	BT D1133 Electrical and Electronics Technology	BT D1243 Computer Programming	BT D2133 Strength of Materials	BT D2232 Applied Control System	BT A3133 Powertrain	BT A3243 Fault Diagnosis	BT D4122 Professional Practice and Ethics	
	BT D1151 Mechanical Laboratory 1	BT D1251 Mechanical Laboratory 2	BT D2142 Mechanical Measurement and Instrumentation	BT D2252 Hydraulic and Pneumatic	BT*3*** ELECTIVE 1	BT*3*** ELECTIVE 4	BT D3222 Internship Preparation	
	BT D1143 Manufacturing Processes	BT D1233 Thermodynamics	BT D2242 Heat Transfer	BT A2663 Automotive Technology	BT*3*** ELECTIVE 2	UGE2002 Technopreneurship		
	BUM1113 Technical Mathematics	BUM1223 Calculus	BT D2273 Project Management and Economy	BUM2113 Applied Mathematics	BT*3*** ELECTIVE 3	UHL2432 English for Professional Communication		
	UQB1**1 Co-curriculum 1	UHL2412 English for Academic Communication	UHF1**1 Foreign Languages Level 1	UHS1022 Soft Skills				
	UHC1012 Falsafah and Isu Semasa	UHC2022 Penghayatan Etika dan Peradaban	UHL2422 English for Technical Communication	UHF2**1 Foreign Languages Level 2				
		UQ*2**1 Co-curriculum 2						
<b>TOTAL CREDIT</b>	<b>19</b>	<b>19</b>	<b>19</b>	<b>18</b>	<b>19</b>	<b>15</b>	<b>17</b>	<b>14</b>
<b>TOTAL CREDIT FOR GRADUATION</b>	<b>140</b>							

**ELECTIVE COURSE TO BE OFFERED IN BACHELOR OF  
MECHANICAL ENGINEERING TECHNOLOGY (AUTOMOTIVE) WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BTD3323	Production Planning and Control	3
2	BTD3333	Mechanics of Composite Materials	3
3	BTD3343	Fatigue Design and Analysis	3
4	BTA3313	Automotive Product Development	3
5	BTA3323	Automotive Advanced Technology	3
6	BTA3333	Energy Efficient Vehicle	3
7	BTA3343	Motorsport Engineering	3
8	BTG3143	Operation and Maintenance of Static Equipment	3
9	BTG3243	Prime Mover in Rotating Equipment	3
10	BTG3343	Operation and Maintenance of Piping	3
11	BTG3433	Pipeline	3
<b>Total Minimum Credit of Elective Subjects for Graduation</b>			<b>12</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Graduates are capable of applying technical knowledge and practical skills to solve Mechanical Engineering Technology (Automotive) problems.
PEO2	Graduates are capable of engaging with continuous development and adopt evolving technologies.
PEO3	Graduates are competent, responsible and practice professionalism.

**PROGRAMME OUTCOMES (PO)**

PO1	Apply the knowledge of technology fundamental to broadly-defined procedures, processes, systems and methodologies in the field of study.
PO2	Propose and employ current tools and techniques to resolve broadly-defined problems.
PO3	Demonstrate deep investigative and significant thinking abilities to solve broadly-defined problems in the field of study.
PO4	Communicate effectively and flexibly in oral and written language for social, academic and professional purposes.
PO5	Illustrate the understanding of corresponding issues related to the society and the subsequent responsibilities to the broadly-defined technology practices.
PO6	Acknowledge the requirement of professional establishment and to employ independent continuing learning in specialist technology.
PO7	Illustrate consciousness of management and technopreneurship routine in real perspective.
PO8	Illustrate ethical awareness and professionalism.
PO9	Illustrate leadership character, mentoring and work efficiently in diverse teams.

## **COURSE SYNOPSIS FOR BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (AUTOMOTIVE) WITH HONOURS**

BTD1112  
Statics  
Credit Hour: 2  
Prerequisite: None

### Synopsis

This course introduces theory and application of principles required to solve applied statics problems. Topics included in this course are moment of force, resultant of forces, couple systems, and transmissibility of forces. The use of free-body diagrams and modeling and analysis of static equilibrium problems focusing on real world engineering applications and problem solving are emphasized. Moreover, the relation between externally applied loads and induced internal forces within structural members and analysis of statically determinate structures, such as trusses and beams, are taught. Axial, shear, and bending-moment diagrams and their relationship are also covered.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Determine the resultant of several vectors and moment of a force and location of centroids.

CLO 2: Analyze truss loads by the method of joint and sections.

CLO 3: Apply static equilibrium and friction laws to solve engineering problems.

BTD1123  
Engineering Materials  
Credit Hour: 3  
Prerequisite: None

### Synopsis

This course offers an engineering materials application, atomic bonding, mechanical and physical properties, microstructure and phase

diagram, ferrous and non-ferrous alloys, polymer, composite, ceramic, and advance materials.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the fundamental of engineering and technology knowledge in improving productivity in mechanical technology, material technology, manufacturing technology, and service companies effectively.

CLO 2: Analyze problem related to material engineering.

CLO 3: Demonstrate the efficient communication through the written report of the engineering material problem.

BTD1133  
Electrical and Electronics Technology  
Credit Hour: 3  
Prerequisite: None

### Synopsis

This course offers an introduction to fundamental of electric circuit involving DC resistive network analysis, AC network analysis, diodes, bipolar junction transistors (BJT), operational amplifier (op-amp) and digital logic circuits.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Explain the fundamental of electric and electronic knowledge.

CLO 2: Construct electric circuit using basic circuit element.

CLO 3: Demonstrate teamwork and leadership in constructing the electric and electronic circuit.

BTD1143  
Manufacturing Processes  
Credit Hour: 3

Prerequisite: None

### Synopsis

This course introduces the student to various types of manufacturing processes used for converting raw material into finished products. This course will cover 3 basic principles in manufacturing which are additive, subtractive and formative.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze different types of manufacturing processes.

CLO 2: Perform manufacturing process technique with standard operation procedure.

CLO 3: Demonstrate work efficiently in diverse teams during operating manufacturing process machine.

BTD1151

Mechanical Laboratory 1

Credit Hour: 1

Prerequisite: None

### Synopsis

This course expose students to safe working habits, learn to identify standard materials used in metal fabrication, read blueprints, identify, use and care of measuring instruments, layout methods and basic hand tools. Emphasis is placed on operation of metrology, benchwork and lathe project.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Demonstrate safety in workshop, basic measurement technique, technical drawing, and skills in using lathe machine and hand tools.

CLO 2: Present the mechanical laboratory works.

CLO 3: Demonstrate leadership and teamworking in Laboratory presentation or report.

BTD1212

Product Development 1

Credit Hour: 2

Prerequisite: None

### Synopsis

Product Development 1 emphasizes several key elements of the design process including defining design problems, generating ideas, and building solutions. Presents a range of design techniques to help students think about, evaluate, and communicate their designs from sketching to physical prototyping. This course includes the use of Theory of Inventive Problem Solving (TRIZ) method to solve the technical contradictions in design. Students work both individually and in teams.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the knowledge of brainstorming techniques, design concept generation, design concept screening, and the problem-solving techniques.

CLO 2: Construct a low fidelity prototype to demonstrate the idea concept using the creative toolkits.

CLO 3: Demonstrate the ability to work and pitch in teams on a themed design project.

BTD1222

Dynamics

Credit Hour: 2

Prerequisite: Statics

### Synopsis

This course introduces kinematics (motion of rigid body) inclusive of absolute and relative motion (displacement, velocity and acceleration) and dynamics (forces, work, energy, inertia and momentum) of rigid body.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze dynamics problems involving kinematics inclusive of absolute and relative motion.

CLO 2: Analyze dynamics problems involving kinetics of rigid bodies inclusive forces based from Newton's Second Law, work, energy and momentum problem.

CLO 3: Presents a project related to principles of dynamics.

#### BTD1233

Thermodynamics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course focuses on fundamental, application and evaluation of various engineering thermodynamics systems. Introduce fundamentals and applications of classical thermodynamics. Understand the concepts of heat, work, energy, and entropy, the First and Second Laws of Thermodynamics and their application. Introduction to the Carnot cycle and the concept of irreversibility. Understand the use of property diagrams in solving heat engine and heat pump cycles. Understand the operation and analysis of the Brayton, Otto, Diesel and Rankine cycles. Introduction to the analysis of refrigeration and heat pump cycles. Perform experiments to illustrate the concepts of Thermodynamics. Simple combustion processes.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the concept of thermodynamics laws in close and open system, and solve related engineering thermodynamics applications.

CLO 2: Analyze the basic of thermodynamics processes with knowledge of law of thermodynamics and engineering consideration.

CLO 3: Measure thermodynamic parameters in related problems i.e. thermodynamics processes, thermodynamics cycles and

combustion cycle.

CLO 4: Demonstrate the work effectively in a team in solving applied problems related to thermodynamics.

#### BTD1243

Computer Programming

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the concept of computer programming language, input and output, variables, constants, arithmetic operations and mathematical functions, user-defined functions, selection making decision and repetitive construct, and array data structure. Student will be introduced to a microcontroller system to apply the programming concept and exposed to digital and analog input output control systems.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Construct program that utilizes standard input output operations, variables, arithmetic operation, and math functions.

CLO 2: Construct program with combination of basic microcontroller devices.

CLO 3: Apply program that utilizes control structure, looping, functions, and numeric arrays to solve Mechanical Engineering problems.

CLO 4: Demonstrate teamwork in completing a programming project.

#### BTD1251

Mechanical Laboratory 2

Credit Hour: 1

Prerequisite: None

#### Synopsis

This course introduce the students on safety procedures in workshop/laboratory, basic application of measuring instrument as well as the interpretation of technical drawing before

operating machining process. Additionally, students will be exposed to the hands-on work in order to develop basics skills in handling machine for milling and surface grinding process.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Demonstrate safety in workshop, demonstrate basic measurement technique, technical drawing interpretation, and basic skills in handling milling machine.

CLO 2: Present the mechanical laboratory works.

CLO 3: Demonstrate leadership and teamworking in Laboratory presentation or report.

BTD2113

Product Development 2

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces graphical communications, technical 2D drawing, 3D part modelling, components assembly and surface design using 3D CAD software. It also includes knowledge and techniques to render the 3D model and preparing a presentable graphics. This course also includes rapid prototyping (3D printing) process and measurement techniques as a simulation to the process involved in the part approval stage. Simple programming will be applied in their group prototype (i.e. embedded sensor in the prototype). Students work both individually and in teams.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply basic knowledge of 2D product design sketching.

CLO 2: Construct standard drawing relating to design in 3D.

CLO 3: Demonstrate the standard industrial design drawing for product development.

CLO 4: Integrate 3D printed parts of a prototype in the group design project.

BTD2123

Fluid Mechanics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the principle, properties and basic methods of fluid mechanics, and provide some understanding and analysis of some problems related to fluid mechanics. The course covers topics such as concept of pressure and flow with its application, stability of floating bodies, fluid in motion analysis, flow measurement devices, fluid friction in piping system, flow over immersed bodies, boundary layer analysis, and pumps. Students are also required to conduct laboratory activities and mini project dealing with course outcomes.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the basic principles and applications of fluid statics and fluid dynamics.

CLO 2: Analyze problems related to flow in pipes, external flow, pump and system.

CLO 3: Demonstrate as an effective team work to solve problems related to fluid mechanics.

CLO 4: Present fluid mechanics projects.

BTD2133

Strength of Materials

Credit Hour: 3

Prerequisite: Statics

#### Synopsis

This course introduce the concepts in strength of materials, stress, strain and deformation under axial load, stress concentrations, torsional shear stresses for circular shaft and

bending stresses. Design and beam analysis is introduced through the construction of shear force and bending moment diagram and selection for the beam design should lead to the most economical design.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the basic concepts and principles of strength of materials.

CLO 2: Demonstrate the efficient communication through the report writing to solve the strength of material problem.

CLO 3: Analyze the design beam problems and real engineering technology applications.

#### BTD2142

Mechanical Measurement and Instrumentation

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course introduces the principles of mechanical measurement, basic signal analysis and provides the students hands-on laboratory experience with a variety (or selected) transducers and instruments (including 'virtual instruments'). Students are also exposed on how to write professional technical reports.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the basic element in mechanical measurement and instrumentation system; and fundamental of selected important transducers.

CLO 2: Build virtual instrumentation system to acquire data from transducer time and/or frequency domain.

CLO 3: Apply the appropriate signal analysis in measuring analogue signal from transducers.

#### BTD2213

Product Development 3

Credit Hour: 3

Prerequisite: Product Development 2

#### Synopsis

Provides students with an overview of design for entertainment and leisure, as well as opportunities in creative product design and design competition. Students develop a prototype to compete in a functional design competition. Work in teams with experienced mentors on a themed design project. Students enhance creativity and experience fundamental aspects of the product development process, including brainstorming, sketch modeling, concept development, design aesthetics, detailed design, and prototyping. Includes written, visual and oral communication.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Outline ideas and proposes a plan to design a functional prototype for design competition.

CLO 2: Construct a functional prototype through various elements of the systems design.

CLO 3: Demonstrate the functionality of the assembled product to meet the demands of client(s) in a competitive environment.

CLO 4: Report course activities as well as technopreneurship aspects of prototype through the logbook and completed final report.

CLO 5: Display adequate skills in project management and teamwork among peers.

#### BTD2223

Mechanical Vibration

Credit Hour: 3

Prerequisite: Dynamics

#### Synopsis

This course introduces fundamental of vibration and vibration analysis for single and multi-degree of freedom system. Additionally,

student will be exposed to vibration measurement and fault diagnosis.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the fundamental of vibration based on single degree of freedom system

CLO 2: Analyze single and multi-degree of freedom system.

CLO 3: Constructs the vibration measurement by considering appropriate techniques, tools and methods.

CLO 4: Demonstrate effective leadership and teamworking ability in completing the group project.

#### BTD2232

Applied Control System

Credit Hour: 2

Prerequisite: Dynamic

#### Synopsis

This course introduces the implementation of a control system and evaluation of criteria of performance of an LTI system, analyze its stability, and design of a controller to improve the system response and comply to a given specification. It includes practical demonstration in electro-mechanical application and implementation of PID and Fuzzy Logic controller.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Differentiate an LTI system, and method to interact with the system using command and sensors.

CLO 2: Analyze the performance of a system, the stability, and issues and limitation to controller implementation.

CLO 3: Build command and data acquisition of a system, transfer function from experimental response, and PID and Fuzzy Logic Controller to comply with specification.

#### BTD2252

Hydraulic and Pneumatic

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course to provide the student with in depth background in the vast field of hydraulic and pneumatic system. This course covers all subject essential to understanding the design, analysis, operation, maintenance and application of hydraulic and pneumatic system. In term of design the course cover manual operated, electromechanical and Programmable Logic Control of hydraulic and pneumatic circuit system.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze Hydraulic/ Pneumatic components and circuits using manual operated, electro and Programmable Logic Control (PLC) system

CLO 2: Construct the circuit complex of Hydraulic and Pneumatic System using software and hardware.

#### BTD2273

Project Management and Engineering Economy

Credit Hour: 3

Prerequisite: None

#### Synopsis

Project Management is essential for any organization that involves in any project. The purpose of this course would be to expose the students to different aspects of project proposal preparation as well as implementation. In order to achieve this, the student will study the major theories, concepts and tools used in companies for the management of national and international projects. This course would benefit a professionally-oriented student who aspires to be a Project Team member in his or her career would benefit from this course.



### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze the principles of project management, integrated approach, strategy and project selection and structure.

CLO 2: Identify the NOD stages and WBS, leadership and effect towards project management.

CLO 3: Explain the engineering economy decision based on the present, future and per annum value of cost.

CLO 4: Organizes a decision-making base on the engineering economic tool.

BTD2242

Heat Transfer

Credit Hour: 2

Prerequisite: None

### Synopsis

This course formally introduces the basic concepts of heat transfer, transport coefficients, steady-state conduction, forced and natural convection, radiative heat transfer, and Heat exchangers.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply fundamental concept of heat conduction, convection and radiation.

CLO 2: Analyze problem related to one-dimensional heat flow in different geometries, convective heat transfer both forced and free convection also radiative heat transfer.

CLO 3: Explain heat transfer concept effectively for industrial application.

BTD3114

Product Development 4

Credit Hour: 4

Prerequisite: Product Development 3

### Synopsis

This course prepares a detailed comprehensive design project considering the design stages only. The student will learn how to apply the knowledge including project management, communication, documentation, teamwork and design methodology. The students will apply the data collections method to identify the customer needs as well and product benchmarking. Then, they will evaluate the needs to create product specification in order to develop the concept design until concept evaluation. This final concept evaluation will be proposed to the customer for the feedback. The final product design will be created using cad software considering manufacturing, assembly, material selections, fabrication method and environmental impact. Once the final design is finished, the final design will be simulated using simulation software in order to determine the reliability of the final design. This final design will then be proposed to the customer including the economic analysis to obtain the customer feedback for further improvement.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Outline ideas and proposes a plan to design a functional prototype to solve problems.

CLO 2: Construct a complete design including mechanical, electrical and software integration.

CLO 3: Demonstrate the functionality of the assembled design that meets the requirements of the client.

CLO 4: Explain and demonstrate the functional design to the clients and evaluators.

CLO 5: Justifies the teamwork of peers through peer review.

BTD3123

Finite Element Analysis

Credit Hour: 3

Prerequisite: Strength of Materials

### Synopsis

This course covers the basics of Finite

Element Method and familiarize students in solving real world problems involving structural, frequency, heat transfer and thermal stress by using FE software.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Describe basics of FEM in mechanical engineering.

CLO 2: Design an appropriate FE model based on real world problems by using FE software.

CLO 3: Analyze and evaluate accuracy of FE model.

BTD3124

Product Development 5

Credit Hour: 4

Prerequisite: Product Development 4

#### Synopsis

This course requires students to study and implement the most economical fabrication/manufacturing/maintenance processes of their prototype based on the idea of design for manufacture and assembly principles. Fabricated prototype must undergo series of testing and demonstration in the relevant environment/expected environment to meet the requirements of technology readiness level TRL 6. Rectification and improvisation work of the prototype has to be conducted in the most economical and practical ways to address the issues encountered during the testing/demonstration.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Ability of solving broadly defined engineering and technology problem during fabrication and integration.

CLO 2: Application of design simplicity through design for manufacture and assembly concept to address cost effective product, good demonstration of management,

business practices and entrepreneurship.

CLO 3: Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities. Prototype/product developed meets the requirements of community/society in needs or addressing industrial/agencies genuine problem.

CLO 4: Function effectively as individuals, and as members or leaders in diverse technical teams.

CLO 5: Documented or logged activities of fabrication, troubleshooting, and reports for future references, for professional development and to engage in independent and lifelong learning.

BTD3222

Internship Preparation

Credit Hour: 2

Prerequisite: None

#### Synopsis

This training provides students with industrial preparation and exposes student to professional skills and experience in mechanical engineering technology practice. Student will apply matured negotiation and excellent interpersonal attitude during training.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Describe basic professional engineering technology skills in industry level and relate to theory that had been learned during study such as planning, design, construction and management in courses.

CLO 2: Demonstrate interpersonal skills and matured negotiation surrounding with excellent ethics and responsible to the creator.

CLO 3: Practice professional engineering skills required in the industry.

BTA4112

Final Year Project

Credit Hour: 12  
Prerequisite: None

### Synopsis

This course is the first stage of Final Year Project which involves preliminary study and planning on a project. The aim of this course is to identify problems and proposing appropriate solutions. It is designed to expose the students in writing a research proposal which emphasizes on the research methodology. At the end of the course, students should be able to plan and execute their project according to the given period as well as to write the research report.

### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Initiate practical engineering skills required in the industry.
- CLO 2: Explains effectively either orally or in written form.
- CLO 3: Organize work according to plan using available resources.
- CLO 4: Integrate into society and environment for sustainable development.
- CLO 5: Combine interpersonal skills with professional ethics.
- CLO 6: Practice current experience for better of mankind.
- CLO 7: Design and development of engineering system.

BTD4131  
Occupational Safety and Health  
Credit Hour: 1  
Prerequisite: None

### Synopsis

The course aims is to familiarize students to the engineering safety principles. The students will be introduced to OSHA 1994 and Factories and Machinery Act 1967 focuses on specific aspects of occupational health and safety managements. At the end of the course, the students are expected to be able to practice occupational safety and health

knowledge especially in the manufacturing, construction, oil and gas industries, such as preparing health and safety strategies and developing internal policies as well as leading in-house training on safety and health issues and risks.

### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Explain the overview of national safety based on OSHA Act1994 and FMA 1967.
- CLO 2: Explain the hazard identification, risk assessment and risk control on general duties and critical condition.
- CLO 3: Demonstrate OSH legal requirements and plan its OSH programs and its impact on society based on Factories and Machineries Act and hazard classification.

BTD4122  
Professional Practice and Ethics  
Credit Hour: 2  
Prerequisite: None

### Synopsis

This course introduces the engineering profession, engineers and research, ethics and public responsibility, engineer and law, engineers and design ethics and contract law.

### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Describe the understanding of engineering profession, accreditations and professional bodies.
- CLO 2: Demonstrate ethics, public responsibility and the laws apply in engineering practice.
- CLO 3: Explain the understanding of sustainable engineering, ethics in research and design.
- CLO 4: Organize the effective leadership and teamworking ability in completing the report and presentation.

BTD3222  
Internship Preparation  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This training provides students with industrial preparation and exposes student to professional skills and experience in mechanical engineering technology practice. Student will apply matured negotiation and excellent interpersonal attitude during training.

#### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Describe basic professional engineering technology skills in industry level and relate to theory that had been learned during study such as planning, design, construction and management in courses.
- CLO 2: Demonstrate interpersonal skills and matured negotiation surrounding with excellent ethics and responsible to the creator.
- CLO 3: Practice professional engineering skills required in the industry.

BTD4212  
Industrial Training  
Credit Hour: 12  
Prerequisite: Internship Preparation

#### Synopsis

This course exposes students to professional skills and experience in industrial company or related aspect. Students involved in actual project of the company from product development to process and distribution. The projects studied by the students deal with topics from elective subject acquired at the university. Students are responsible to find a suitable project at the training company. With this exposure, it will help to produce excellent, responsible and good attitude graduates.

#### Course Learning Outcome

By the end of semester, students should be

able to:

- CLO 1: Initiate practical engineering skills required in the industry.
- CLO 2: Explains effectively either orally or in written form.
- CLO 3: Organize work according to plan using available resources.
- CLO 4: Integrate into society and environment for sustainable development.
- CLO 5: Combine interpersonal skills with professional ethics.
- CLO 6: Demonstrate team work and leadership skills to solve problems in companies.
- CLO 7: Practice current experience for better of mankind.

#### CORE COURSES FOR BTA

BTA2663  
Automotive Technology  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course is about introduction to the latest Automotive Technologies. It covers the fundamental principles of system operation and progresses gradually to complex diagnostic and service procedures. It also covers the current information on the latest technology, industry trends, and state-of-the-art tools and techniques thorough coverage of the developments in the automotive field, including electric, hybrid vehicle technology.

#### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Demonstrate the fundamental principal in automotive, and latest technology of the development in the automotive fields.
- CLO2: Explain the problem in the automotive industry.
- CLO3: Propose a vehicle concept which suitable for the current needs of the world.

BTD3123

Powertrain  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This subject will be discussed on theory, operation and application on engine and transmission management system. Topics will be covered are Electronic Fuel Injection (EFI), Diesel engine management system, Engine control unit (ECU), On-board diagnostic system, Hybrid Vehicle control system and sensors or actuators inside powertrain management system.

#### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Identify components inside the powertrain management system.
- CLO2: Explain the functions and operations of engine and transmission management system.
- CLO3: Demonstrate the control equipments for testing and develop electronic control unit.

BTA3233  
Autotronics  
Credit Hour: 3  
Prerequisite: Electrical & Electronics Technology

#### Synopsis

This course covers comprehensive overview in the area of automotive electrical and electronics and familiarises students with both analytical and computational approaches in evaluating and designing vehicle electrical and electronics components and systems as well as innovative approach in automotive electronics systems.

#### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Appraise the fundamental theory in automotive electrical and electronics components.
- CLO2: Manipulate embedded system for vehicle electrical and electronic systems and networking.
- CLO3: Evaluate major automotive electronic system designs and performance.
- CLO4: Perform an investigation team to complete innovative vehicle electronic components, sub-systems and networking.

BTA3243  
Fault Diagnosis  
Credit Hour: 3  
Prerequisite: Powertrain

#### Synopsis

This course introduces basic knowledge and hands-on experience to the students on the understanding on the automotive systems, its error symptoms, related fault sources, and the method to diagnose the faults. The topics cover the fault and diagnosis of conventional, electric, and hybrid powertrain systems, chassis system, electrical system and drivetrain system.

#### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Distinguish various automotive system, system error, possible fault sources, and various diagnostic tools and methods used in automotive fault and diagnosis.
- CLO2: Compose reliable methods to diagnose vehicle system based on the reported and sensed symptom of errors.
- CLO3: Design diagnostic procedure for powertrain system, chassis system, electrical system, and drivetrain system using proper diagnostic tools.
- CLO4: Performs an investigation team with proper task distributions and schedules to identify the system error in a controlled environment.

#### ELECTIVE COURSES FOR BTA

### BTD3323

Production Planning and Control

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces planning and control, forecasting, aggregate planning, production scheduling, just-in-time production, inventory management, material requirements planning. Simulation on production operation using Witness software is assigned.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Evaluate forecasting method using qualitative and quantitative methods.

CLO 2: Evaluate the aggregate planning using level, chase and transportation methods.

CLO 3: Describe the best solution using Lean manufacturing and material requirement planning.

CLO 4: Analyze a new production layout by using Witness software.

### BTD3333

Mechanics of Composite Materials

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces students to current views and theories in polymer based composite materials, on the types of materials, production methods, quality assurance, failure analysis, test methods and the mechanics of lamina and laminated composites.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Explain different types of composite materials, production methods to produce polymer matrix composites and the main properties of a lamina and the laminated of

composite materials.

CLO 2: Compare the failure modes of composites and evaluate different type of failure criteria in laminated composites, and composite materials in the future.

CLO 3: Describe mechanical test/simulation on laminated composites.

### BTD3343

Fatigue Design and Analysis

Credit Hour: 3

Prerequisite: None

#### Synopsis

Introduction to factors affecting fatigue behavior and characteristics of design approach. Study on cycle counting techniques. Fatigue design methods including stress life, strain life and linear elastic fracture mechanics methods under constant and variable amplitude loading.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply fatigue design criteria.

CLO 2: Evaluate a component under fatigue loading.

CLO 3: Construct Finite Element Analysis for fatigue design.

### BTA3313

Automotive Product Development

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the concept of automotive product development process. It covers the research and development process, stages of tooling process, production line process as well as the quality system used in automotive production line.

#### Course Learning Outcome

By the end of semester, students should be

able to:

CLO 1: Explain the research and development process of automotive product and its organization.

CLO 2: Compare the tooling process in products development based on parts function.

CLO 3: Justify the manufacturing process flow in car production line based on safety and human factors.

CLO 4: Identify the effect of manufacturing process on the quality of the production parts.

BTA3323

Automotive Advance Technology

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course is the advance construction, development and operational analysis of the state-of-the-art vehicle system which including engine advance control system for higher efficiency, lower emission, advance suspension for excellent ride and comfort, advance driveline for spacious, precision, minimum slips control, advance material for lighter, cheaper and stronger component, chassis and body, advance energy powering system for renewable and sustainability future and advance vehicle mobility control.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Compares the antilock braking, vehicle aerodynamics, tire tread design advances.

CLO 2: Combines electronically controlled anti-vibration engine mountings and transport refrigeration.

CLO 3: Differentiate electricity, alcohol, and hydrogen fuel cells, as well as advanced additives and oils, in environmentally sustainable transport.

CLO 4: Explain of engine diagnosis and troubleshooting of automotive engine control systems including digital storage oscilloscopes, fuel injection and ignition

system diagnoses, five-gas exhaust analysis and emission testing. Generate Seat belts, brake lights, and air bags, of safer vehicles and fewer fatalities.

BTA3333

Energy Efficient Vehicle

Credit Hour: 3

Prerequisite: Automotive Powertrain

#### Synopsis

Energy Efficient Vehicle or EEV is a new concept of categorize automotive technology towards the low fuel consumption, alternative and sustainable automotive system. Under the EEV definition, there are multiple approaches, technology, alternative fuels, materials and etc. In this course, some foundation of automotive highlighted and followed by sustainability of different green technology, electrification and detail hybrid electric vehicle design, operation, construction and diagnosis.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Evaluate the evolution of automotive electrification and technology sustainability.

CLO 2: Analyze the design of various energy efficient vehicle technology combination.

CLO 3: Summarize the architecture of different hybrid electric vehicle, safety design and influent of local policy and enforcement.

CLO 4: Analyze the construction and operation mechanism for hybrid electric vehicle low voltage, high voltage system, and its performance under different fault code driving condition.

BTA3343

Motorsport Engineering

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course focuses on the introduction to

motorsports engineering, types of racing engines, advanced vehicle materials and structure, and manufacturing technique extant in this field. It also covers the modification as enhancement in motorsport system feature, racing theories and strategies, regulation and safety in motorsports engineering.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Appraise the fundamental of motorsports engineering in the basis of racing theories, strategies, regulations, and safety.

CLO 2: Evaluate the advancement of motorsport in the aspect of advanced materials and structure usage and modification techniques.

CLO 3: Evaluate the advancement of motorsport in the aspect of manufacturing techniques utilize in the production of components and parts for motorsports.

BTG3143

Operation and Maintenance of Static Equipment (Elective)

Credit Hour: 3

Prerequisite: None

#### Synopsis

The course specifies the aspect of operation and maintenance of static equipment in the oil and gas/ related industries application. Static equipment covered are including furnaces, fire and unfired pressure vessel, types of valves, types of heat exchangers and its ancillary sub-system such as water treatment, steam trap and steam strainer. The part on operational contents will examine key issues relevant to the selected operations, process and flow assembly of refinery and several relevant industries. The content on maintenance part will encompass the selected predictive, preventive, or corrective types of maintenance protocols for the selected essential static equipment. Both industrial standards and safe working environment, their need and challenges, will be discussed accordingly. Finally, student will be capable to supervise,

observe and manage the operation and maintenance of selected static equipment with sound justifications from the law and technological practices.

#### Course Outcome

By the end of semester, students should be able to:

CLO1: Differentiate operations of the selected static equipment such as furnaces, fire and unfired pressure vessel, types of valves, types of heat exchanger and its sub-system such as water treatment, steam trap, steam strainer. (C4, PLO1)

CLO2: Perform various maintenance, inspection, and testing procedures on the selected static equipment such as furnaces, fire and unfired pressure vessel, types of valves, types of heat exchanger and its sub-system such as water treatment, steam trap, steam strainer (P4, PLO2)

CLO3: Analyse methods and relevant to industrial standards and related safety concern as stipulated by OSHA Act 1994 as well as the Factories and Machineries Act 1967/13 (C4, PLO3)

CLO4: Interpretation of and testing on selected static equipment based on guidelines from Factories and Machineries Act 1967/ 13 essential fittings / related 3rd parties. (A5, PLO9)

BTG3243

Prime Mover in Rotating Equipment (Elective)

Credit Hour: 3

Prerequisite: None

#### Synopsis

The course provides a comprehensive and in-depth discussion on rotating equipment used as industrial prime movers including reciprocating piston engine, gas turbine and steam turbine. The course also discuss topics around fundamental and working principles, sound maintenance practice and inspection related to rotating machinery relevant to the oil and gas industry.

#### Course Outcome



By the end of semester, students should be able to:

CLO1: Evaluate major components, problems and maintenance of reciprocating Piston Engine and Gas Turbine. (C5, PLO1)

CLO2: Conduct experiment for various type of rotating equipment. (P4, PLO2)

CLO3: Evaluate major components, problems and maintenance of Steam Turbine. (C5, PLO3)

CLO4: Display effective leadership and team working ability in completing the group project. (A5, PLO9)

#### BTG3343

Operation and Maintenance of Piping (Elective)

Credit Hour: 3

Prerequisite: None

#### Synopsis

The course covers the aspects of specifying the fabrication activities, cutting, bevelling, metal forming and bending, maintenance, inspection and testing. Both the maintenance and inspection aspects will be discussed encompassing topics in welding, isolation, pipe and fitting, bolted flange joint, valve, strainer, painting, and insulation for the former and visual inspection, Non-Destructive Testing (NDT), painting and insulation for the latter. Testing sub-topics will explain on pipe and fittings, valves, and insulation.

#### Course Outcome

By the end of semester, students should be able to:

CLO1: Distinguish the appropriate fabrication and maintenance activities, inspection and testing for piping system based on relevant design regulation, codes and standard used in oil and gas industries. (C4, PLO1)

CLO2: Perform various maintenance, inspection and testing exercises to the piping systems. (P7, PLO2)

CLO3: Demonstrate the technical capability to formulate solution to specific problems in the piping systems including on the aspects of

fabrication and inspection. (A3, PLO4)

#### BTG3433

Pipeline (Elective)

Credit Hour: 3

Prerequisite: None

#### Synopsis

The course elucidates the types and functions of facility and pipeline systems, their technical design considerations according to relevant design codes and standards. This is followed by discussion on the justifications for construction and pigging a pipeline, designing a pipeline system complete with programmes overseeing the maintenance and inspection exercises. In addition, the course provides reviews into pipeline engineering from the mechanical design perspective. A brief overview of pipeline operations, structural integrity assessment of the pipeline will also be discussed.

#### Course Outcome

By the end of semester, students should be able to:

CLO1: Evaluate the appropriate piping types, components, sizing, and materials based on relevant design regulation, codes and standard used in oil and gas industries. (C5, PLO1)

CLO2: Determine the required piping thickness and corresponding resultant stresses in the piping and critical components and understand piping operations, inspection, maintenance, repair strategies and assess various protection systems against in-service corrosion and abrasion. (C4, PLO3)

CLO3: Able to explain the ASME B31.3 design compendium to design the systems of piping satisfying the requirements for oil and gas sectors. (A3, PLO4)

## CURRICULUM STRUCTURE BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (DESIGN AND ANALYSIS) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH (WBL IN INDUSTRY)	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
	BTD1112 Statics	BTD1212 Product Development 1	BTD2113 Product Development 2	BTD2213 Product Development 3	BTD3114 Product Development 4	BTD3124 Product Development 5	BTD4112 Final Year Project	BTD4212 Industrial Training
	BTD1123 Engineering Materials	BTD2123 Fluid Mechanics	BTD1222 Dynamics	BTD3123 Finite Element Analysis	BTD2223 Mechanical Vibration	BTD3243 Stress Analysis	BTD4131 Occupational Safety and Health	
	BTD1133 Electrical and Electronics Technology	BTD1243 Computer Programming	BTD2133 Strength of Materials	BTD2232 Applied Control System	BTD3133 Ergonomics and Human Factors	BTD3233 Computational Fluid Dynamics	BTD4122 Professional Practice and Ethics	
	BTD1151 Mechanical Laboratory 1	BTD1251 Mechanical Laboratory 2	BTD2142 Mechanical Measurement and Instrumentation	BTD2252 Hydraulic and Pneumatic	BT*3**3A Elective 1	BT*3**3D Elective 4	BTD3222 Internship Preparation	
	BTD1143 Manufacturing Processes	BTD1233 Thermodynamics	BTD2242 Heat Transfer	BUM2113 Applied Mathematics	BT*3**3B Elective 2	UGE2002 Technopreneurship		
	BUM1113 Technical Mathematics	BUM1223 Calculus	BTD2273 Project Management and Economy	BTD2663 Elements of Mechanical Design	BT*3**3C Elective 3	UHL2432 English for Professional Communication		
	UQB1**1 Co-curriculum 1	UHL2412 English for Academic Communication	UHF1**1 Foreign Languages Level 1	UHS1022 Soft Skills				
	UHC1012 Falsafah and Isu Semasa	UHC2022 PENGHAYATAN ETIKA DAN PERADABAN	UHL2422 English for Technical Communication	UHF2**1 Foreign Languages Level 2				
		UQ*2**1 Co-curriculum 2						
<b>TOTAL CREDIT</b>	<b>18</b>	<b>20</b>	<b>18</b>	<b>19</b>	<b>19</b>	<b>17</b>	<b>17</b>	<b>12</b>
<b>TOTAL CREDIT FOR GRADUATION</b>	<b>140</b>							

**ELECTIVE COURSE TO BE OFFERED IN BACHELOR OF  
MECHANICAL ENGINEERING TECHNOLOGY (DESIGN AND ANALYSIS) WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BTD3323	Production Planning and Control	3
2	BTD3333	Mechanics of Composite Materials	3
3	BTD3343	Fatigue Design and Analysis	3
4	BTA3313	Automotive Product Development	3
5	BTA3323	Automotive Advanced Technology	3
6	BTA3333	Energy Efficient Vehicle	3
7	BTA3343	Motorsport Engineering	3
8	BTG3143	Operation and Maintenance of Static Equipment	3
9	BTG3243	Prime Mover in Rotating Equipment	3
10	BTG3343	Operation and Maintenance of Piping	3
11	BTG3433	Pipeline	3
<b>Total Minimum Credit of Elective Subjects for Graduation</b>			<b>12</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Graduates are capable of applying technical knowledge and practical skills to solve Mechanical Engineering Technology (Design and Analysis) problems.
PEO2	Graduates are capable of engaging with continuous development and adopt evolving technologies.
PEO3	Graduates are competent, responsible and practice professionalism.

**PROGRAMME LEARNING OUTCOMES (PLO)**

PLO1	Apply the knowledge of technology fundamental to broadly-defined procedures, processes, systems and methodologies in the field of study.
PLO2	Propose and employ current tools and techniques to resolve broadly-defined problems.
PLO3	Demonstrate deep investigative and significant thinking abilities to solve broadly-defined problems in the field of study.
PLO4	Communicate effectively and flexibly in oral and written language for social, academic and professional purposes.
PLO5	Illustrate the understanding of corresponding issues related to the society and the subsequent responsibilities to the broadly-defined technology practices.
PLO6	Acknowledge the requirement of professional establishment and to employ independent continuing learning in specialist technology.
PLO7	Illustrate consciousness of management and technopreneurship routine in real perspective.
PLO8	Illustrate ethical awareness and professionalism.
PLO9	Illustrate leadership character, mentoring and work efficiently in diverse teams.

**COURSE SYNOPSIS FOR BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (DESIGN AND ANALYSIS) WITH HONOURS**

BTD1112  
Statics  
Credit Hour: 2  
Prerequisite: None

**Synopsis**

This course introduces theory and application of principles required to solve applied statics problems. Topics included in this course are moment of force, resultant of forces, couple systems, and transmissibility of forces. The use of free-body diagrams and modeling and analysis of static equilibrium problems focusing on real world engineering applications and problem solving are emphasized. Moreover, the relation between externally applied loads and induced internal forces within structural members and analysis of statically determinate structures, such as trusses and beams, are taught. Axial, shear, and bending-moment diagrams and their relationship are also covered.

**Course Learning Outcome**

By the end of semester, students should be able to:

CLO 1: Determine the resultant of several vectors and moment of a force and location of centroids.

CLO 2: Analyze truss loads by the method of joint and sections.

CLO 3: Apply static equilibrium and friction laws to solve engineering problems.

BTD1123  
Engineering Materials  
Credit Hour: 3  
Prerequisite: None

**Synopsis**

This course offers an engineering materials application, atomic bonding, mechanical and physical properties, microstructure and phase

diagram, ferrous and non-ferrous alloys, polymer, composite, ceramic, and advance materials.

**Course Learning Outcome**

By the end of semester, students should be able to:

CLO 1: Apply the fundamental of engineering and technology knowledge in improving productivity in mechanical technology, material technology, manufacturing technology, and service companies effectively.

CLO 2: Analyze problem related to material engineering.

CLO 3: Demonstrate the efficient communication through the written report of the engineering material problem.

BTD1133  
Electrical and Electronics Technology  
Credit Hour: 3  
Prerequisite: None

**Synopsis**

This course offers an introduction to fundamental of electric circuit involving DC resistive network analysis, AC network analysis, diodes, bipolar junction transistors (BJT), operational amplifier (op-amp) and digital logic circuits.

**Course Learning Outcome**

By the end of semester, students should be able to:

CLO 1: Explain the fundamental of electric and electronic knowledge.

CLO 2: Construct electric circuit using basic circuit element.

CLO 3: Demonstrate teamwork and leadership in constructing the electric and electronic circuit.

BTD1143  
Manufacturing Processes  
Credit Hour: 3

Prerequisite: None

### Synopsis

This course introduces the student to various types of manufacturing processes used for converting raw material into finished products. This course will cover 3 basic principles in manufacturing which are additive, subtractive and formative.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze different types of manufacturing processes.

CLO 2: Perform manufacturing process technique with standard operation procedure.

CLO 3: Demonstrate work efficiently in diverse teams during operating manufacturing process machine.

BTD1151

Mechanical Laboratory 1

Credit Hour: 1

Prerequisite: None

### Synopsis

This course expose students to safe working habits, learn to identify standard materials used in metal fabrication, read blueprints, identify, use and care of measuring instruments, layout methods and basic hand tools. Emphasis is placed on operation of metrology, benchwork and lathe project.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Demonstrate safety in workshop, basic measurement technique, technical drawing, and skills in using lathe machine and hand tools.

CLO 2: Present the mechanical laboratory works.

CLO 3: Demonstrate leadership and teamworking in Laboratory presentation or report.

BTD1212

Product Development 1

Credit Hour: 2

Prerequisite: None

### Synopsis

Product Development 1 emphasizes several key elements of the design process including defining design problems, generating ideas, and building solutions. Presents a range of design techniques to help students think about, evaluate, and communicate their designs from sketching to physical prototyping. This course includes the use of Theory of Inventive Problem Solving (TRIZ) method to solve the technical contradictions in design. Students work both individually and in teams.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the knowledge of brainstorming techniques, design concept generation, design concept screening, and the problem-solving techniques.

CLO 2: Construct a low fidelity prototype to demonstrate the idea concept using the creative toolkits.

CLO 3: Demonstrate the ability to work and pitch in teams on a themed design project.

BTD1222

Dynamics

Credit Hour: 2

Prerequisite: Statics

### Synopsis

This course introduces kinematics (motion of rigid body) inclusive of absolute and relative motion (displacement, velocity and acceleration) and dynamics (forces, work, energy, inertia and momentum) of rigid body.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze dynamics problems involving kinematics inclusive of absolute and relative motion.

CLO 2: Analyze dynamics problems involving kinetics of rigid bodies inclusive forces based from Newton's Second Law, work, energy and momentum problem.

CLO 3: Presents a project related to principles of dynamics.

#### BTD1233

Thermodynamics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course focuses on fundamental, application and evaluation of various engineering thermodynamics systems. Introduce fundamentals and applications of classical thermodynamics. Understand the concepts of heat, work, energy, and entropy, the First and Second Laws of Thermodynamics and their application. Introduction to the Carnot cycle and the concept of irreversibility. Understand the use of property diagrams in solving heat engine and heat pump cycles. Understand the operation and analysis of the Brayton, Otto, Diesel and Rankine cycles. Introduction to the analysis of refrigeration and heat pump cycles. Perform experiments to illustrate the concepts of Thermodynamics. Simple combustion processes.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the concept of thermodynamics laws in close and open system, and solve related engineering thermodynamics applications.

CLO 2: Analyze the basic of thermodynamics processes with knowledge of law of thermodynamics and engineering consideration.

CLO 3: Measure thermodynamic parameters in related problems i.e. thermodynamics processes, thermodynamics cycles and combustion cycle.

CLO 4: Demonstrate the work effectively in a team in solving applied problems related to thermodynamics.

#### BTD1243

Computer Programming

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the concept of computer programming language, input and output, variables, constants, arithmetic operations and mathematical functions, user-defined functions, selection making decision and repetitive construct, and array data structure. Student will be introduced to a microcontroller system to apply the programming concept and exposed to digital and analog input output control systems.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Construct program that utilizes standard input output operations, variables, arithmetic operation, and math functions.

CLO 2: Construct program with combination of basic microcontroller devices.

CLO 3: Apply program that utilizes control structure, looping, functions, and numeric arrays to solve Mechanical Engineering problems.

CLO 4: Demonstrate teamwork in completing a programming project.

#### BTD1251

Mechanical Laboratory 2

Credit Hour: 1

Prerequisite: None

#### Synopsis

This course introduce the students on safety

procedures in workshop/laboratory, basic application of measuring instrument as well as the interpretation of technical drawing before operating machining process. Additionally, students will be exposed to the hands-on work in order to develop basics skills in handling machine for milling and surface grinding process.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Demonstrate safety in workshop, demonstrate basic measurement technique, technical drawing interpretation, and basic skills in handling milling machine.

CLO 2: Present the mechanical laboratory works.

CLO 3: Demonstrate leadership and teamworking in Laboratory presentation or report.

BTD2113

Product Development 2

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces graphical communications, technical 2D drawing, 3D part modelling, components assembly and surface design using 3D CAD software. It also includes knowledge and techniques to render the 3D model and preparing a presentable graphics. This course also includes rapid prototyping (3D printing) process and measurement techniques as a simulation to the process involved in the part approval stage. Simple programming will be applied in their group prototype (i.e. embedded sensor in the prototype). Students work both individually and in teams.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply basic knowledge of 2D product

design sketching.

CLO 2: Construct standard drawing relating to design in 3D.

CLO 3: Demonstrate the standard industrial design drawing for product development.

CLO 4: Integrate 3D printed parts of a prototype in the group design project.

BTD2123

Fluid Mechanics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the principle, properties and basic methods of fluid mechanics, and provide some understanding and analysis of some problems related to fluid mechanics. The course covers topics such as concept of pressure and flow with its application, stability of floating bodies, fluid in motion analysis, flow measurement devices, fluid friction in piping system, flow over immersed bodies, boundary layer analysis, and pumps. Students are also required to conduct laboratory activities and mini project dealing with course outcomes.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the basic principles and applications of fluid statics and fluid dynamics.

CLO 2: Analyze problems related to flow in pipes, external flow, pump and system.

CLO 3: Demonstrate as an effective team work to solve problems related to fluid mechanics.

CLO 4: Present fluid mechanics projects.

BTD2133

Strength of Materials

Credit Hour: 3

Prerequisite: Statics

#### Synopsis

This course introduce the concepts in strength

of materials, stress, strain and deformation under axial load, stress concentrations, torsional shear stresses for circular shaft and bending stresses. Design and beam analysis is introduced through the construction of shear force and bending moment diagram and selection for the beam design should lead to the most economical design.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the basic concepts and principles of strength of materials.

CLO 2: Demonstrate the efficient communication through the report writing to solve the strength of material problem.

CLO 3: Analyze the design beam problems and real engineering technology applications.

BTD2142  
Mechanical Measurement and  
Instrumentation  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This course introduces the principles of mechanical measurement, basic signal analysis and provides the students hands-on laboratory experience with a variety (or selected) transducers and instruments (including 'virtual instruments'). Students are also exposed on how to write professional technical reports.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the basic element in mechanical measurement and instrumentation system; and fundamental of selected important transducers.

CLO 2: Build virtual instrumentation system to acquire data from transducer time and/or frequency domain.

CLO 3: Apply the appropriate signal analysis

in measuring analogue signal from transducers.

BTD2213  
Product Development 3  
Credit Hour: 3  
Prerequisite: Product Development 2

#### Synopsis

Provides students with an overview of design for entertainment and leisure, as well as opportunities in creative product design and design competition. Students develop a prototype to compete in a functional design competition. Work in teams with experienced mentors on a themed design project. Students enhance creativity and experience fundamental aspects of the product development process, including brainstorming, sketch modeling, concept development, design aesthetics, detailed design, and prototyping. Includes written, visual and oral communication.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Outline ideas and proposes a plan to design a functional prototype for design competition.

CLO 2: Construct a functional prototype through various elements of the systems design.

CLO 3: Demonstrate the functionality of the assembled product to meet the demands of client(s) in a competitive environment.

CLO 4: Report course activities as well as technopreneurship aspects of prototype through the logbook and completed final report.

CLO 5: Display adequate skills in project management and teamwork among peers.

BTD2223  
Mechanical Vibration  
Credit Hour: 3  
Prerequisite: Dynamics

#### Synopsis



This course introduces fundamental of vibration and vibration analysis for single and multi-degree of freedom system. Additionally, student will be exposed to vibration measurement and fault diagnosis.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the fundamental of vibration based on single degree of freedom system

CLO 2: Analyze single and multi-degree of freedom system.

CLO 3: Constructs the vibration measurement by considering appropriate techniques, tools and methods.

CLO 4: Demonstrate effective leadership and teamworking ability in completing the group project.

BTD2232

Applied Control System

Credit Hour: 2

Prerequisite: Dynamic

#### Synopsis

This course introduces the implementation of a control system and evaluation of criteria of performance of an LTI system, analyze its stability, and design of a controller to improve the system response and comply to a given specification. It includes practical demonstration in electro-mechanical application and implementation of PID and Fuzzy Logic controller.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Differentiate an LTI system, and method to interact with the system using command and sensors.

CLO 2: Analyze the performance of a system, the stability, and issues and limitation to controller implementation.

CLO 3: Build command and data acquisition of

a system, transfer function from experimental response, and PID and Fuzzy Logic Controller to comply with specification.

BTD2252

Hydraulic and Pneumatic

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course to provide the student with in depth background in the vast field of hydraulic and pneumatic system. This course covers all subject essential to understanding the design, analysis, operation, maintenance and application of hydraulic and pneumatic system. In term of design the course cover manual operated, electromechanical and Programmable Logic Control of hydraulic and pneumatic circuit system.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze Hydraulic/ Pneumatic components and circuits using manual operated, electro and Programmable Logic Control (PLC) system

CLO 2: Construct the circuit complex of Hydraulic and Pneumatic System using software and hardware.

BTD2273

Project Management and Engineering Economy

Credit Hour: 3

Prerequisite: None

#### Synopsis

Project Management is essential for any organization that involves in any project. The purpose of this course would be to expose the students to different aspects of project proposal preparation as well as implementation. In order to achieve this, the student will study the major theories, concepts and tools used in companies for the

management of national and international projects. This course would benefit a professionally-oriented student who aspires to be a Project Team member in his or her career would benefit from this course.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze the principles of project management, integrated approach, strategy and project selection and structure.

CLO 2: Identify the NOD stages and WBS, leadership and effect towards project management.

CLO 3: Explain the engineering economy decision based on the present, future and per annum value of cost.

CLO 4: Organizes a decision-making base on the engineering economic tool.

BTD2242

Heat Transfer

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course formally introduces the basic concepts of heat transfer, transport coefficients, steady-state conduction, forced and natural convection, radiative heat transfer, and Heat exchangers.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply fundamental concept of heat conduction, convection and radiation.

CLO 2: Analyze problem related to one-dimensional heat flow in different geometries, convective heat transfer both forced and free convection also radiative heat transfer.

CLO 3: Explain heat transfer concept effectively for industrial application.

BTD3114

Product Development 4

Credit Hour: 4

Prerequisite: Product Development 3

#### Synopsis

This course prepares a detailed comprehensive design project considering the design stages only. The student will learn how to apply the knowledge including project management, communication, documentation, teamwork and design methodology. The students will apply the data collections method to identify the customer needs as well and product benchmarking. Then, they will evaluate the needs to create product specification in order to develop the concept design until concept evaluation. This final concept evaluation will be proposed to the customer for the feedback. The final product design will be created using cad software considering manufacturing, assembly, material selections, fabrication method and environmental impact. Once the final design is finished, the final design will be simulated using simulation software in order to determine the reliability of the final design. This final design will then be proposed to the customer including the economic analysis to obtain the customer feedback for further improvement.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Outline ideas and proposes a plan to design a functional prototype to solve problems.

CLO 2: Construct a complete design including mechanical, electrical and software integration.

CLO 3: Demonstrate the functionality of the assembled design that meets the requirements of the client.

CLO 4: Explain and demonstrate the functional design to the clients and evaluators.

CLO 5: Justifies the teamwork of peers through peer review.

BTD3123

Finite Element Analysis

Credit Hour: 3

Prerequisite: Strength of Materials

### Synopsis

This course covers the basics of Finite Element Method and familiarize students in solving real world problems involving structural, frequency, heat transfer and thermal stress by using FE software.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Describe basics of FEM in mechanical engineering.

CLO 2: Design an appropriate FE model based on real world problems by using FE software.

CLO 3: Analyze and evaluate accuracy of FE model.

BTD3124

Product Development 5

Credit Hour: 4

Prerequisite: Product Development 4

### Synopsis

This course requires students to study and implement the most economical fabrication/manufacturing/maintenance processes of their prototype based on the idea of design for manufacture and assembly principles. Fabricated prototype must undergo series of testing and demonstration in the relevant environment/expected environment to meet the requirements of technology readiness level TRL 6. Rectification and improvisation work of the prototype has to be conducted in the most economical and practical ways to address the issues encountered during the testing/demonstration.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Ability of solving broadly defined

engineering and technology problem during fabrication and integration.

CLO 2: Application of design simplicity through design for manufacture and assembly concept to address cost effective product, good demonstration of management, business practices and entrepreneurship.

CLO 3: Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities. Prototype/product developed meets the requirements of community/society in needs or addressing industrial/agencies genuine problem.

CLO 4: Function effectively as individuals, and as members or leaders in diverse technical teams.

CLO 5: Documented or logged activities of fabrication, troubleshooting, and reports for future references, for professional development and to engage in independent and lifelong learning.

BTD3222

Internship Preparation

Credit Hour: 2

Prerequisite: None

### Synopsis

This training provides students with industrial preparation and exposes student to professional skills and experience in mechanical engineering technology practice. Student will apply matured negotiation and excellent interpersonal attitude during training.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Describe basic professional engineering technology skills in industry level and relate to theory that had been learned during study such as planning, design, construction and management in courses.

CLO 2: Demonstrate interpersonal skills and matured negotiation surrounding with excellent ethics and responsible to the creator.

CLO 3: Practice professional engineering skills required in the industry.

BTD4112  
Final Year Project  
Credit Hour: 12  
Prerequisite: None

#### Synopsis

This course is the first stage of Final Year Project which involves preliminary study and planning on a project. The aim of this course is to identify problems and proposing appropriate solutions. It is designed to expose the students in writing a research proposal which emphasizes on the research methodology. At the end of the course, students should be able to plan and execute their project according to the given period as well as to write the research report.

#### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Initiate practical engineering skills required in the industry.
- CLO 2: Explains effectively either orally or in written form.
- CLO 3: Organize work according to plan using available resources.
- CLO 4: Integrate into society and environment for sustainable development.
- CLO 5: Combine interpersonal skills with professional ethics.
- CLO 6: Practice current experience for better of mankind.
- CLO 7: Design and development of engineering system.

BTD4122  
Professional Practice and Ethics  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This course introduces the engineering profession, engineers and research, ethics

and public responsibility, engineer and law, engineers and design ethics and contract law.

#### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Describe the understanding of engineering profession, accreditations and professional bodies.
- CLO 2: Demonstrate ethics, public responsibility and the laws apply in engineering practice.
- CLO 3: Explain the understanding of sustainable engineering, ethics in research and design.
- CLO 4: Organize the effective leadership and teamworking ability in completing the report and presentation.

BTD4131  
Occupational Safety and Health  
Credit Hour: 1  
Prerequisite: None

#### Synopsis

The course aims is to familiarize students to the engineering safety principles. The students will be introduced to OSHA 1994 and Factories and Machinery Act 1967 focuses on specific aspects of occupational health and safety managements. At the end of the course, the students are expected to be able to practice occupational safety and health knowledge especially in the manufacturing, construction, oil and gas industries, such as preparing health and safety strategies and developing internal policies as well as leading in-house training on safety and health issues and risks.

#### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Explain the overview of national safety based on OSHA Act 1994 and FMA 1967.
- CLO 2: Explain the hazard identification, risk assessment and risk control on general duties

and critical condition.

CLO 3: Demonstrate OSH legal requirements and plan its OSH programs and its impact on society based on Factories and Machineries Act and hazard classification.

BTD4212

Industrial Training

Credit Hour: 12

Prerequisite: Internship Preparation

### Synopsis

This course exposes students to professional skills and experience in industrial company or related aspect. Students involved in actual project of the company from product development to process and distribution. The projects studied by the students deal with topics from elective subject acquired at the university. Students are responsible to find a suitable project at the training company. With this exposure, it will help to produce excellent, responsible and good attitude graduates.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Initiate practical engineering skills required in the industry.

CLO 2: Explains effectively either orally or in written form.

CLO 3: Organize work according to plan using available resources.

CLO 4: Integrate into society and environment for sustainable development.

CLO 5: Combine interpersonal skills with professional ethics.

CLO 6: Demonstrate team work and leadership skills to solve problems in companies.

CLO 7: Practice current experience for better of mankind.

### CORE COURSES FOR BTD

BTD2663

Elements of Mechanical Design

Credit Hour: 3

Prerequisite: None

### Synopsis

This course introduces the failure theories under static and variable loadings, machine elements/components including shafts, springs, bolts and nuts, screws, welding, bearings, gears and belts. Students will be exposed to the important features of these elements, methods of analyzing and designing them.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze the components to prevent failure due to static and variable loads.

CLO 2: Evaluate the stresses in machine elements under various loads.

CLO 3: Explain a mechanical structure design involving machine elements such as shaft, gears, bearing, fastener, belt and spring.

BTD3133

Ergonomics and Human Factors

Credit Hour: 3

Prerequisite: None

### Synopsis

The Ergonomics and human factors course is concerned with the achievement of optimal relationships between humans and their work environment (human factors design). Emphasis will also be on design and analysis of occupational systems and consumer products which best "fit" job tasks or user requirements to human capabilities.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Identify the physiology and psychology of human behavior as it relates to workplace safety.

CLO 2: Construct the consumer product/equipment design based on ergonomic and human factors requirements

using CAD Software.

CLO 3: Explain appropriate controls to overcome ergonomic hazards.

CLO 4: Propose the work place environmental design that relate the human and workplace factors which contribute to ergonomic hazards.

BTD3233

Computational Fluid Dynamics

Credit Hour: 3

Prerequisite: Fluid Mechanics

### Synopsis

This course will cover the introduction of computational fluid dynamics (CFD) by demonstrating how various fluid mechanics problems can be simulated. The students will be exposed to the fundamental theory of CFD through a governing equation. After that, the students will learn step by step in the pre-processing and post-processing phases needed to solve basic fluid problems such as internal flow, external flow and heat transfer flow. Then, the students will be facilitated on how to simulate various fluid problems, to extract and demonstrate the numerical solutions.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Explain fundamental of fluid flow and computational fluid dynamics (CFD).

CLO 2: Perform CFD pre-processing phase by designing and describing the basic model, choosing the right boundary conditions and the solver.

CLO 3: Demonstrate post-processing stage of CFD by extracting and analyzing an appropriate numerical solution.

CLO 4: Solve fluid mechanics problems using CFD software in a group project.

BTD3243

Stress Analysis

Credit Hour: 3

Prerequisite: Finite Element Analysis

### Synopsis

This course introduces computational mechanics for the analysis of solid and structural problem where static and dynamic loadings are considered. Finite element methods and solution procedures are presented in this course. The stress analysis using FEM is a powerful method in computational mechanics for computing the displacements, stresses and strains in a structure under a set of loads. Applications include finite element analyses, modeling of problems, and interpretation of simulation results.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Investigate the stresses, strains and fatigue in a structure under a set of loads.

CLO 2: Perform finite element simulation to predict fatigue life.

CLO 3: Analyze fatigue life on engineering structure.

CLO 4: Prepare project report on analysis of fatigue life.

### ELECTIVE COURSES FOR BTD

BTD3323

Production Planning and Control

Credit Hour: 3

Prerequisite: None

### Synopsis

This course introduces planning and control, forecasting, aggregate planning, production scheduling, just-in-time production, inventory management, material requirements planning. Simulation on production operation using Witness software is assigned.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Evaluate forecasting method using qualitative and quantitative methods.

CLO 2: Evaluate the aggregate planning using level, chase and transportation methods.

CLO 3: Describe the best solution using Lean manufacturing and material requirement planning.

CLO 4: Analyze a new production layout by using Witness software.

BTD3333

Mechanics of Composite Materials

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces students to current views and theories in polymer based composite materials, on the types of materials, production methods, quality assurance, failure analysis, test methods and the mechanics of lamina and laminated composites.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Explain different types of composite materials, production methods to produce polymer matrix composites and the main properties of a lamina and the laminated of composite materials.

CLO 2: Compare the failure modes of composites and evaluate different type of failure criterions in laminated composites, and composite materials in the future.

CLO 3: Describe mechanical test/simulation on laminated composites.

BTD3343

Fatigue Design and Analysis

Credit Hour: 3

Prerequisite: None

#### Synopsis

Introduction to factors affecting fatigue behavior and characteristics of design approach. Study on cycle counting

techniques. Fatigue design methods including stress life, strain life and linear elastic fracture mechanics methods under constant and variable amplitude loading.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply fatigue design criteria.

CLO 2: Evaluate a component under fatigue loading.

CLO 3: Construct Finite Element Analysis for fatigue design.

BTA3313

Automotive Product Development

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the concept of automotive product development process. It covers the research and development process, stages of tooling process, production line process as well as the quality system used in automotive production line.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Explain the research and development process of automotive product and its organization.

CLO 2: Compare the tooling process in products development based on parts function.

CLO 3: Justify the manufacturing process flow in car production line based on safety and human factors.

CLO 4: Identify the effect of manufacturing process on the quality of the production parts.

BTA3323

Automotive Advance Technology

Credit Hour: 3

Prerequisite: None

## Synopsis

This course is the advance construction, development and operational analysis of the state-of-the-art vehicle system which including engine advance control system for higher efficiency, lower emission, advance suspension for excellent ride and comfort, advance driveline for spacious, precision, minimum slips control, advance material for lighter, cheaper and stronger component, chassis and body, advance energy powering system for renewable and sustainability future and advance vehicle mobility control.

## Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Compares the antilock braking, vehicle aerodynamics, tire tread design advances.

CLO 2: Combines electronically controlled anti-vibration engine mountings and transport refrigeration.

CLO 3: Differentiate electricity, alcohol, and hydrogen fuel cells, as well as advanced additives and oils, in environmentally sustainable transport.

CLO 4: Explain of engine diagnosis and troubleshooting of automotive engine control systems including digital storage oscilloscopes, fuel injection and ignition system diagnoses, five-gas exhaust analysis and emission testing. Generate Seat belts, brake lights, and air bags, of safer vehicles and fewer fatalities.

BTA3333

Energy Efficient Vehicle

Credit Hour: 3

Prerequisite: Automotive Powertrain

## Synopsis

Energy Efficient Vehicle or EEV is a new concept of categorize automotive technology towards the low fuel consumption, alternative and sustainable automotive system. Under the EEV definition, there are multiple approaches, technology, alternative fuels,

materials and etc. In this course, some foundation of automotive highlighted and followed by sustainability of different green technology, electrification and detail hybrid electric vehicle design, operation, construction and diagnosis.

## Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Evaluate the evolution of automotive electrification and technology sustainability.

CLO 2: Analyze the design of various energy efficient vehicle technology combination.

CLO 3: Summarize the architecture of different hybrid electric vehicle, safety design and influent of local policy and enforcement.

CLO 4: Analyze the construction and operation mechanism for hybrid electric vehicle low voltage, high voltage system, and its performance under different fault code driving condition.

BTA3343

Motorsport Engineering

Credit Hour: 3

Prerequisite: None

## Synopsis

This course focuses on the introduction to motorsports engineering, types of racing engines, advanced vehicle materials and structure, and manufacturing technique extant in this field. It also covers the modification as enhancement in motorsport system feature, racing theories and strategies, regulation and safety in motorsports engineering.

## Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Appraise the fundamental of motorsports engineering in the basis of racing theories, strategies, regulations, and safety.

CLO 2: Evaluate the advancement of motorsport in the aspect of advanced materials and structure usage and



modification techniques.

CLO 3: Evaluate the advancement of motorsport in the aspect of manufacturing techniques utilize in the production of components and parts for motorsports.

BTG3143

Operation and Maintenance of Static Equipment (Elective)

Credit Hour: 3

Prerequisite: None

### Synopsis

The course specifies the aspect of operation and maintenance of static equipment in the oil and gas/ related industries application. Static equipment covered are including furnaces, fire and unfired pressure vessel, types of valves, types of heat exchangers and its ancillary sub-system such as water treatment, steam trap and steam strainer. The part on operational contents will examine key issues relevant to the selected operations, process and flow assembly of refinery and several relevant industries. The content on maintenance part will encompass the selected predictive, preventive, or corrective types of maintenance protocols for the selected essential static equipment. Both industrial standards and safe working environment, their need and challenges, will be discussed accordingly. Finally, student will be capable to supervise, observe and manage the operation and maintenance of selected static equipment with sound justifications from the law and technological practices.

### Course Outcome

By the end of semester, students should be able to:

CLO1: Differentiate operations of the selected static equipment such as furnaces, fire and unfired pressure vessel, types of valves, types of heat exchanger and its sub-system such as water treatment, steam trap, steam strainer. (C4, PLO1)

CLO2: Perform various maintenance, inspection, and testing procedures on the selected static equipment such as furnaces,

fire and unfired pressure vessel, types of valves, types of heat exchanger and its sub-system such as water treatment, steam trap, steam strainer (P4, PLO2)

CLO3: Analyse methods and relevant to industrial standards and related safety concern as stipulated by OSHA Act 1994 as well as the Factories and Machineries Act 1967/13 (C4, PLO3)

CLO4: Interpretation of and testing on selected static equipment based on guidelines from Factories and Machineries Act 1967/ 13 essential fittings / related 3rd parties. (A5, PLO9)

BTG3243

Prime Mover in Rotating Equipment (Elective)

Credit Hour: 3

Prerequisite: None

### Synopsis

The course provides a comprehensive and in-depth discussion on rotating equipment used as industrial prime movers including reciprocating piston engine, gas turbine and steam turbine. The course also discuss topics around fundamental and working principles, sound maintenance practice and inspection related to rotating machinery relevant to the oil and gas industry.

### Course Outcome

By the end of semester, students should be able to:

CLO1: Evaluate major components, problems and maintenance of reciprocating Piston Engine and Gas Turbine. (C5, PLO1)

CLO2: Conduct experiment for various type of rotating equipment. (P4, PLO2)

CLO3: Evaluate major components, problems and maintenance of Steam Turbine. (C5, PLO3)

CLO4; Display effective leadership and team working ability in completing the group project. (A5, PLO9)

BTG3343

Operation and Maintenance of Piping

(Elective)

Credit Hour: 3

Prerequisite: None

### Synopsis

The course covers the aspects of specifying the fabrication activities, cutting, bevelling, metal forming and bending, maintenance, inspection and testing. Both the maintenance and inspection aspects will be discussed encompassing topics in welding, isolation, pipe and fitting, bolted flange joint, valve, strainer, painting, and insulation for the former and visual inspection, Non-Destructive Testing (NDT), painting and insulation for the latter. Testing sub-topics will explain on pipe and fittings, valves, and insulation.

### Course Outcome

By the end of semester, students should be able to:

CLO1: Distinguish the appropriate fabrication and maintenance activities, inspection and testing for piping system based on relevant design regulation, codes and standard used in oil and gas industries. (C4, PLO1)

CLO2: Perform various maintenance, inspection and testing exercises to the piping systems. (P7, PLO2)

CLO3: Demonstrate the technical capability to formulate solution to specific problems in the piping systems including on the aspects of fabrication and inspection. (A3, PLO4)

BTG3433

Pipeline (Elective)

Credit Hour: 3

Prerequisite: None

### Synopsis

The course elucidates the types and functions of facility and pipeline systems, their technical design considerations according to relevant design codes and standards. This is followed by discussion on the justifications for construction and pigging a pipeline, designing a pipeline system complete with programmes overseeing the maintenance and inspection

exercises. In addition, the course provides reviews into pipeline engineering from the mechanical design perspective. A brief overview of pipeline operations, structural integrity assessment of the pipeline will also be discussed.

### Course Outcome

By the end of semester, students should be able to:

CLO1: Evaluate the appropriate piping types, components, sizing, and materials based on relevant design regulation, codes and standard used in oil and gas industries. (C5, PLO1)

CLO2: Determine the required piping thickness and corresponding resultant stresses in the piping and critical components and understand piping operations, inspection, maintenance, repair strategies and assess various protection systems against in-service corrosion and abrasion. (C4, PLO3)

CLO3: Able to explain the ASME B31.3 design compendium to design the systems of piping satisfying the requirements for oil and gas sectors. (A3, PLO4)

**CURRICULUM STRUCTURE  
BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (OIL AND GAS) WITH HONOURS**

YEAR	FIRST		SECOND		THIRD		FOURTH (WBL IN INDUSTRY)	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
	BTD1112 Statics	BTD1212 Product Development 1	BTD2113 Product Development 2	BTD2213 Product Development 3	BTD3114 Product Development 4	BTD3124 Product Development 5	BTD4112 Final Year Project	BTD4212 Industrial Training
	BTD1123 Engineering Materials	BTD2123 Fluid Mechanics	BTD1222 Dynamics	BTD3123 Finite Element Analysis	BTD2223 Mechanical Vibration	BTG3333 Piping	BTD4131 Occupational Safety and Health	
	BTD1133 Electrical and Electronics Technology	BTD1243 Computer Programming	BTD2133 Strength of Materials	BTD2232 Applied Control System	BTG3133 Static Equipment	BTG3233 Rotating Equipment	BTD4122 Professional Practice and Ethics	
	BTD1151 Mechanical Laboratory 1	BTD1251 Mechanical Laboratory 2	BTD2142 Mechanical Measurement and Instrumentation	BTD2252 Hydraulic and Pneumatic	BT*3**3A Elective 1	BT*3**3D Elective 4	BTD3222 Internship Preparation	
	BTD1143 Manufacturing Processes	BTD1233 Thermodynamics	BTD2242 Heat Transfer	BUM2113 Applied Mathematics	BT*3**3B Elective 2	UGE2002 Technopreneurship		
	BUM1113 Technical Mathematics	BUM1223 Calculus	BTD2273 Project Management and Economy	BTG2263 Introduction to Oil and Gas Industry	BT*3**3C Elective 3	UHL2432 English for Professional Communication		
	UQB1**1 Co-curriculum 1	UHL2412 English for Academic Communication	UHF1**1 Foreign Languages Level 1	UHS1022 Soft Skills				
	UHC1012 Falsafah and Isu Semasa	UHC2022 PENGHAYATAN ETIKA dan PERADABAN	UHL2422 English for Technical Communication	UHF2**1 Foreign Languages Level 2				
		UQ*2**1 Co-curriculum 2						
<b>TOTAL CREDIT</b>	<b>18</b>	<b>20</b>	<b>18</b>	<b>19</b>	<b>19</b>	<b>17</b>	<b>17</b>	<b>12</b>
<b>TOTAL CREDIT FOR GRADUATION</b>	<b>140</b>							

**TIVE COURSE TO BE OFFERED IN BACHELOR OF MECHANICAL ENGINEERING  
TECHNOLOGY (OIL & GAS) WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BTD3323	Production Planning and Control	3
2	BTD3333	Mechanics of Composite Materials	3
3	BTD3343	Fatigue Design and Analysis	3
4	BTA3313	Automotive Product Development	3
5	BTA3323	Automotive Advanced Technology	3
6	BTA3333	Energy Efficient Vehicle	3
7	BTA3343	Motorsport Engineering	3
8	BTG3143	Operation and Maintenance of Static Equipment	3
9	BTG3243	Prime Mover in Rotating Equipment	3
10	BTG3343	Operation and Maintenance of Piping	3
11	BTG3433	Pipeline	3
<b>Total Minimum Credit of Elective Subjects for Graduation</b>			<b>12</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Graduates are capable of applying technical knowledge and practical skills to solve Mechanical Engineering Technology (Oil and Gas) problems.
PEO2	Graduates are capable of engaging with continuous development and adopt evolving technologies in oil and gas field.
PEO3	Graduates are competent, responsible and practise professionalism.

**PROGRAMME OUTCOMES (PO)**

The Bachelor of Mechanical Engineering Technology (Oil and Gas) ensures that their students attain:	
PO1	Apply the knowledge of technology fundamental to broadly-defined procedures, processes, systems and methodologies in the field of study.
PO2	Propose and employ current tools and techniques to resolve broadly-defined problems.
PO3	Demonstrate deep investigative and significant thinking abilities to solve broadly-defined problems in the field of study.
PO4	Communicate effectively and flexibly, in written and verbally for social, academic and professional purposes.
PO5	Illustrate the understanding of corresponding/contemporary issues related to society and the subsequent responsibilities to the broadly-defined technology practices.
PO6	Acknowledge the requirement of professional establishment and to employ independent continuing/life-long learning in specialist technology.
PO7	Illustrate consciousness of management and technopreneurship attributes in real perspective.
PO8	Illustrate ethical awareness and professionalism.
PO9	Illustrate leadership attributes, mentoring skills and ability to deliver efficiently in diverse teams.

## **COURSE SYNOPSIS FOR BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (OIL AND GAS) WITH HONOURS (BTG) 2021/2022**

BTD1112

Statics

Credit Hour: 2

Prerequisite: None

### Synopsis

This course introduces theory and application of principles required to solve applied statics problems. Topics included in this course are moment of force, resultant of forces, couple systems, and transmissibility of forces. The use of free-body diagrams and modeling and analysis of static equilibrium problems focusing on real world engineering applications and problem solving are emphasized. Moreover, the relation between externally applied loads and induced internal forces within structural members and analysis of statically determinate structures, such as trusses and beams, are taught. Axial, shear, and bending-moment diagrams and their relationship are also covered.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Determine the resultant of several vectors and moment of a force and location of centroids.

CLO 2: Analyze truss loads by the method of joint and sections.

CLO 3: Apply static equilibrium and friction laws to solve engineering problems.

BTD1123

Engineering Materials

Credit Hour: 3

Prerequisite: None

### Synopsis

This course offers an engineering materials application, atomic bonding, mechanical and

physical properties, microstructure and phase diagram, ferrous and non-ferrous alloys, polymer, composite, ceramic, and advance materials.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the fundamental of engineering and technology knowledge in improving productivity in mechanical technology, material technology, manufacturing technology, and service companies effectively.

CLO 2: Analyze problem related to material engineering.

CLO 3: Demonstrate the efficient communication through the written report of the engineering material problem.

BTD1133

Electrical and Electronics Technology

Credit Hour: 3

Prerequisite: None

### Synopsis

This course offers an introduction to fundamental of electric circuit involving DC resistive network analysis, AC network analysis, diodes, bipolar junction transistors (BJT), operational amplifier (op-amp) and digital logic circuits.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Explain the fundamental of electric and electronic knowledge.

CLO 2: Construct electric circuit using basic circuit element.

CLO 3: Demonstrate teamwork and leadership in constructing the electric and electronic circuit.

BTD1143

Manufacturing Processes

Credit Hour: 3  
Prerequisite: None

### Synopsis

This course introduces the student to various types of manufacturing processes used for converting raw material into finished products. This course will cover 3 basic principles in manufacturing which are additive, subtractive and formative.

### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Analyze different types of manufacturing processes.
- CLO 2: Perform manufacturing process technique with standard operation procedure.
- CLO 3: Demonstrate work efficiently in diverse teams during operating manufacturing process machine.

BTD1151  
Mechanical Laboratory 1  
Credit Hour: 1  
Prerequisite: None

### Synopsis

This course expose students to safe working habits, learn to identify standard materials used in metal fabrication, read blueprints, identify, use and care of measuring instruments, layout methods and basic hand tools. Emphasis is placed on operation of metrology, benchwork and lathe project.

### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Demonstrate safety in workshop, basic measurement technique, technical drawing, and skills in using lathe machine and hand tools.
- CLO 2: Present the mechanical laboratory works.
- CLO 3: Demonstrate leadership and teamworking in Laboratory presentation or

report.

BTD1212  
Product Development 1  
Credit Hour: 2  
Prerequisite: None

### Synopsis

Product Development 1 emphasizes several key elements of the design process including defining design problems, generating ideas, and building solutions. Presents a range of design techniques to help students think about, evaluate, and communicate their designs from sketching to physical prototyping. This course includes the use of Theory of Inventive Problem Solving (TRIZ) method to solve the technical contradictions in design. Students work both individually and in teams.

### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Apply the knowledge of brainstorming techniques, design concept generation, design concept screening, and the problem-solving techniques.
- CLO 2: Construct a low fidelity prototype to demonstrate the idea concept using the creative toolkits.
- CLO 3: Demonstrate the ability to work and pitch in teams on a themed design project.

BTD1222  
Dynamics  
Credit Hour: 2  
Prerequisite: Statics

### Synopsis

This course introduces kinematics (motion of rigid body) inclusive of absolute and relative motion (displacement, velocity and acceleration) and dynamics (forces, work, energy, inertia and momentum) of rigid body.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze dynamics problems involving kinematics inclusive of absolute and relative motion.

CLO 2: Analyze dynamics problems involving kinetics of rigid bodies inclusive forces based from Newton's Second Law, work, energy and momentum problem.

CLO 3: Presents a project related to principles of dynamics.

#### BTD1233

Thermodynamics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course focuses on fundamental, application and evaluation of various engineering thermodynamics systems. Introduce fundamentals and applications of classical thermodynamics. Understand the concepts of heat, work, energy, and entropy, the First and Second Laws of Thermodynamics and their application. Introduction to the Carnot cycle and the concept of irreversibility. Understand the use of property diagrams in solving heat engine and heat pump cycles. Understand the operation and analysis of the Brayton, Otto, Diesel and Rankine cycles. Introduction to the analysis of refrigeration and heat pump cycles. Perform experiments to illustrate the concepts of Thermodynamics. Simple combustion processes.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the concept of thermodynamics laws in close and open system, and solve related engineering thermodynamics applications.

CLO 2: Analyze the basic of thermodynamics processes with knowledge of law of thermodynamics and engineering consideration.

CLO 3: Measure thermodynamic parameters in related problems i.e. thermodynamics processes, thermodynamics cycles and combustion cycle.

CLO 4: Demonstrate the work effectively in a team in solving applied problems related to thermodynamics.

#### BTD1243

Computer Programming

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the concept of computer programming language, input and output, variables, constants, arithmetic operations and mathematical functions, user-defined functions, selection making decision and repetitive construct, and array data structure. Student will be introduced to a microcontroller system to apply the programming concept and exposed to digital and analog input output control systems.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Construct program that utilizes standard input output operations, variables, arithmetic operation, and math functions.

CLO 2: Construct program with combination of basic microcontroller devices.

CLO 3: Apply program that utilizes control structure, looping, functions, and numeric arrays to solve Mechanical Engineering problems.

CLO 4: Demonstrate teamwork in completing a programming project.

#### BTD1251

Mechanical Laboratory 2

Credit Hour: 1

Prerequisite: None

#### Synopsis

This course introduce the students on safety

procedures in workshop/laboratory, basic application of measuring instrument as well as the interpretation of technical drawing before operating machining process. Additionally, students will be exposed to the hands-on work in order to develop basics skills in handling machine for milling and surface grinding process.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Demonstrate safety in workshop, demonstrate basic measurement technique, technical drawing interpretation, and basic skills in handling milling machine.

CLO 2: Present the mechanical laboratory works.

CLO 3: Demonstrate leadership and teamworking in Laboratory presentation or report.

BTD2113

Product Development 2

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces graphical communications, technical 2D drawing, 3D part modelling, components assembly and surface design using 3D CAD software. It also includes knowledge and techniques to render the 3D model and preparing a presentable graphics. This course also includes rapid prototyping (3D printing) process and measurement techniques as a simulation to the process involved in the part approval stage. Simple programming will be applied in their group prototype (i.e. embedded sensor in the prototype). Students work both individually and in teams.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply basic knowledge of 2D product

design sketching.

CLO 2: Construct standard drawing relating to design in 3D.

CLO 3: Demonstrate the standard industrial design drawing for product development.

CLO 4: Integrate 3D printed parts of a prototype in the group design project.

BTD2123

Fluid Mechanics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the principle, properties and basic methods of fluid mechanics, and provide some understanding and analysis of some problems related to fluid mechanics. The course covers topics such as concept of pressure and flow with its application, stability of floating bodies, fluid in motion analysis, flow measurement devices, fluid friction in piping system, flow over immersed bodies, boundary layer analysis, and pumps. Students are also required to conduct laboratory activities and mini project dealing with course outcomes.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the basic principles and applications of fluid statics and fluid dynamics.

CLO 2: Analyze problems related to flow in pipes, external flow, pump and system.

CLO 3: Demonstrate as an effective team work to solve problems related to fluid mechanics.

CLO 4: Present fluid mechanics projects.

BTD2133

Strength of Materials

Credit Hour: 3

Prerequisite: Statics

#### Synopsis

This course introduce the concepts in strength



of materials, stress, strain and deformation under axial load, stress concentrations, torsional shear stresses for circular shaft and bending stresses. Design and beam analysis is introduced through the construction of shear force and bending moment diagram and selection for the beam design should lead to the most economical design.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the basic concepts and principles of strength of materials.

CLO 2: Demonstrate the efficient communication through the report writing to solve the strength of material problem.

CLO 3: Analyze the design beam problems and real engineering technology applications.

BTD2142  
Mechanical Measurement and  
Instrumentation  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This course introduces the principles of mechanical measurement, basic signal analysis and provides the students hands-on laboratory experience with a variety (or selected) transducers and instruments (including 'virtual instruments'). Students are also exposed on how to write professional technical reports.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the basic element in mechanical measurement and instrumentation system; and fundamental of selected important transducers.

CLO 2: Build virtual instrumentation system to acquire data from transducer time and/or frequency domain.

CLO 3: Apply the appropriate signal analysis

in measuring analogue signal from transducers.

BTD2213  
Product Development 3  
Credit Hour: 3  
Prerequisite: Product Development 2

#### Synopsis

Provides students with an overview of design for entertainment and leisure, as well as opportunities in creative product design and design competition. Students develop a prototype to compete in a functional design competition. Work in teams with experienced mentors on a themed design project. Students enhance creativity and experience fundamental aspects of the product development process, including brainstorming, sketch modeling, concept development, design aesthetics, detailed design, and prototyping. Includes written, visual and oral communication.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Outline ideas and proposes a plan to design a functional prototype for design competition.

CLO 2: Construct a functional prototype through various elements of the systems design.

CLO 3: Demonstrate the functionality of the assembled product to meet the demands of client(s) in a competitive environment.

CLO 4: Report course activities as well as technopreneurship aspects of prototype through the logbook and completed final report.

CLO 5: Display adequate skills in project management and teamwork among peers.

BTD2223  
Mechanical Vibration  
Credit Hour: 3  
Prerequisite: Dynamics

#### Synopsis

This course introduces fundamental of vibration and vibration analysis for single and multi-degree of freedom system. Additionally, student will be exposed to vibration measurement and fault diagnosis.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply the fundamental of vibration based on single degree of freedom system

CLO 2: Analyze single and multi-degree of freedom system.

CLO 3: Constructs the vibration measurement by considering appropriate techniques, tools and methods.

CLO 4: Demonstrate effective leadership and teamworking ability in completing the group project.

#### BTD2232

Applied Control System

Credit Hour: 2

Prerequisite: Dynamic

#### Synopsis

This course introduces the implementation of a control system and evaluation of criteria of performance of an LTI system, analyze its stability, and design of a controller to improve the system response and comply to a given specification. It includes practical demonstration in electro-mechanical application and implementation of PID and Fuzzy Logic controller.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Differentiate an LTI system, and method to interact with the system using command and sensors.

CLO 2: Analyze the performance of a system, the stability, and issues and limitation to controller implementation.

CLO 3: Build command and data acquisition of a system, transfer function from experimental

response, and PID and Fuzzy Logic Controller to comply with specification.

#### BTD2252

Hydraulic and Pneumatic

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course to provide the student with in depth background in the vast field of hydraulic and pneumatic system. This course covers all subject essential to understanding the design, analysis, operation, maintenance and application of hydraulic and pneumatic system. In term of design the course cover manual operated, electromechanical and Programmable Logic Control of hydraulic and pneumatic circuit system.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze Hydraulic/ Pneumatic components and circuits using manual operated, electro and Programmable Logic Control (PLC) system

CLO 2: Construct the circuit complex of Hydraulic and Pneumatic System using software and hardware.

#### BTD2273

Project Management and Engineering Economy

Credit Hour: 3

Prerequisite: None

#### Synopsis

Project Management is essential for any organization that involves in any project. The purpose of this course would be to expose the students to different aspects of project proposal preparation as well as implementation. In order to achieve this, the student will study the major theories, concepts and tools used in companies for the management of national and international

projects. This course would benefit a professionally-oriented student who aspires to be a Project Team member in his or her career would benefit from this course.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Analyze the principles of project management, integrated approach, strategy and project selection and structure.

CLO 2: Identify the NOD stages and WBS, leadership and effect towards project management.

CLO 3: Explain the engineering economy decision based on the present, future and per annum value of cost.

CLO 4: Organizes a decision-making base on the engineering economic tool.

BTD2242

Heat Transfer

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course formally introduces the basic concepts of heat transfer, transport coefficients, steady-state conduction, forced and natural convection, radiative heat transfer, and Heat exchangers.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Apply fundamental concept of heat conduction, convection and radiation.

CLO 2: Analyze problem related to one-dimensional heat flow in different geometries, convective heat transfer both forced and free convection also radiative heat transfer.

CLO 3: Explain heat transfer concept effectively for industrial application.

BTD3114

Product Development 4

Credit Hour: 4

Prerequisite: Product Development 3

#### Synopsis

This course prepares a detailed comprehensive design project considering the design stages only. The student will learn how to apply the knowledge including project management, communication, documentation, teamwork and design methodology. The students will apply the data collections method to identify the customer needs as well and product benchmarking. Then, they will evaluate the needs to create product specification in order to develop the concept design until concept evaluation. This final concept evaluation will be proposed to the customer for the feedback. The final product design will be created using cad software considering manufacturing, assembly, material selections, fabrication method and environmental impact. Once the final design is finished, the final design will be simulated using simulation software in order to determine the reliability of the final design. This final design will then be proposed to the customer including the economic analysis to obtain the customer feedback for further improvement.

#### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Outline ideas and proposes a plan to design a functional prototype to solve problems.

CLO 2: Construct a complete design including mechanical, electrical and software integration.

CLO 3: Demonstrate the functionality of the assembled design that meets the requirements of the client.

CLO 4: Explain and demonstrate the functional design to the clients and evaluators.

CLO 5: Justifies the teamwork of peers through peer review.

BTD3123

Finite Element Analysis

Credit Hour: 3

Prerequisite: Strength of Materials

### Synopsis

This course covers the basics of Finite Element Method and familiarize students in solving real world problems involving structural, frequency, heat transfer and thermal stress by using FE software.

### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Describe basics of FEM in mechanical engineering.
- CLO 2: Design an appropriate FE model based on real world problems by using FE software.
- CLO 3: Analyze and evaluate accuracy of FE model.

BTD3124  
Product Development 5  
Credit Hour: 4  
Prerequisite: Product Development 4

### Synopsis

This course requires students to study and implement the most economical fabrication/manufacturing/maintenance processes of their prototype based on the idea of design for manufacture and assembly principles. Fabricated prototype must undergo series of testing and demonstration in the relevant environment/expected environment to meet the requirements of technology readiness level TRL 6. Rectification and improvisation work of the prototype has to be conducted in the most economical and practical ways to address the issues encountered during the testing/demonstration.

### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Ability of solving broadly defined engineering and technology problem during

fabrication and integration.

CLO 2: Application of design simplicity through design for manufacture and assembly concept to address cost effective product, good demonstration of management, business practices and entrepreneurship.

CLO 3: Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities. Prototype/product developed meets the requirements of community/society in needs or addressing industrial/agencies genuine problem.

CLO 4: Function effectively as individuals, and as members or leaders in diverse technical teams.

CLO 5: Documented or logged activities of fabrication, troubleshooting, and reports for future references, for professional development and to engage in independent and lifelong learning.

BTD3222  
Internship Preparation  
Credit Hour: 2  
Prerequisite: None

### Synopsis

This training provides students with industrial preparation and exposes student to professional skills and experience in mechanical engineering technology practice. Student will apply matured negotiation and excellent interpersonal attitude during training.

### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Describe basic professional engineering technology skills in industry level and relate to theory that had been learned during study such as planning, design, construction and management in courses.
- CLO 2: Demonstrate interpersonal skills and matured negotiation surrounding with excellent ethics and responsible to the creator.
- CLO 3: Practice professional engineering skills required in the industry.

BTD4112  
Final Year Project  
Credit Hour: 12  
Prerequisite: None

#### Synopsis

This course is the first stage of Final Year Project which involves preliminary study and planning on a project. The aim of this course is to identify problems and proposing appropriate solutions. It is designed to expose the students in writing a research proposal which emphasizes on the research methodology. At the end of the course, students should be able to plan and execute their project according to the given period as well as to write the research report.

#### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Initiate practical engineering skills required in the industry.
- CLO 2: Explains effectively either orally or in written form.
- CLO 3: Organize work according to plan using available resources.
- CLO 4: Integrate into society and environment for sustainable development.
- CLO 5: Combine interpersonal skills with professional ethics.
- CLO 6: Practice current experience for better of mankind.
- CLO 7: Design and development of engineering system.

BTD4122  
Professional Practice and Ethics  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This course introduces the engineering profession, engineers and research, ethics and public responsibility, engineer and law, engineers and design ethics and contract law.

#### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Describe the understanding of engineering profession, accreditations and professional bodies.
- CLO 2: Demonstrate ethics, public responsibility and the laws apply in engineering practice.
- CLO 3: Explain the understanding of sustainable engineering, ethics in research and design.
- CLO 4: Organize the effective leadership and teamworking ability in completing the report and presentation.

BTD4131  
Occupational Safety and Health  
Credit Hour: 1  
Prerequisite: None

#### Synopsis

The course aims is to familiarize students to the engineering safety principles. The students will be introduced to OSHA 1994 and Factories and Machinery Act 1967 focuses on specific aspects of occupational health and safety managements. At the end of the course, the students are expected to be able to practice occupational safety and health knowledge especially in the manufacturing, construction, oil and gas industries, such as preparing health and safety strategies and developing internal policies as well as leading in-house training on safety and health issues and risks.

#### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Explain the overview of national safety based on OSHA Act1994 and FMA 1967.
- CLO 2: Explain the hazard identification, risk assessment and risk control on general duties and critical condition.
- CLO 3: Demonstrate OSH legal requirements and plan its OSH programs and its impact on society based on Factories and Machineries Act and hazard classification.

**BTD4212**

Industrial Training

Credit Hour: 12

Prerequisite: Internship Preparation

**Synopsis**

This course exposes students to professional skills and experience in industrial company or related aspect. Students involved in actual project of the company from product development to process and distribution. The projects studied by the students deal with topics from elective subject acquired at the university. Students are responsible to find a suitable project at the training company. With this exposure, it will help to produce excellent, responsible and good attitude graduates.

**Course Learning Outcome**

By the end of semester, students should be able to:

CLO 1: Initiate practical engineering skills required in the industry.

CLO 2: Explains effectively either orally or in written form.

CLO 3: Organize work according to plan using available resources.

CLO 4: Integrate into society and environment for sustainable development.

CLO 5: Combine interpersonal skills with professional ethics.

CLO 6: Demonstrate team work and leadership skills to solve problems in companies.

CLO 7: Practice current experience for better of mankind.

**CORE COURSES FOR BTG****BTG2263**

Introduction to Oil and Gas Industry

Credit Hour: 3

Prerequisite: None

**Synopsis**

This is an introductory course to the upstream, mid-stream and downstream processing stages of the crude oil, gas and condensate products. It focuses on the

methods/techniques, design concepts and applications relevant to various processes related in oil, gas and condensate production. Aspects of compliance to governmental acts, regulations and design standards are also being embedded into the course learning activities.

**Course Outcome**

By the end of semester, students should be able to:

CLO1: Analyse equipment and their inspection, maintenance and repair related to crude oil, gas and condensate production processing. (C04, PL01)

CLO2: Characterise the production processing systems based on design standards (C04, PL03)

CLO3: Relate industrial practices in relation to compliance of governmental acts, health and safety regulations, and design standards. (A04, PL04)

**BTG3133**

Static Equipment

Credit Hour: 3

Prerequisite: None

**Synopsis**

The course allows students to acquire relevant knowledge and essential skills on static equipment and ancillary sub-systems commonly encountered in the processing plants for oil and gas, petrochemical and oleochemical industries. Students will be exposed to the aspects of design analysis, assessment, and acceptance criteria of the fired and unfired pressure vessels. Design and analysis via computational and analytical characterisations will also be introduced. Other elements including process equipment, flanges, shells, formed head, and wind and seismic calculation will also be introduced.

**Course Outcome**

By the end of semester, students should be able to:

CLO1: Identify equipment and their inspection

requirements, maintenance and repair related to crude oil, gas and condensate production processing. (C04, PL01)

CLO2: Characterise the production processing systems based on design standards (C04, PL03)

CLO3: Relate industrial practices in relation to compliance of governmental acts, health and safety regulations, and design standards. (A04, PL04)

BTG3233

Rotating Equipment

Credit Hour: 3

Prerequisite: None

### Synopsis

The course descends into a comprehensive and in-depth discussion on rotating equipment such as pumps, compressors, fan, blower, and turbo expander. The course also discuss the fundamental and working principles of such equipment, best practice in maintenance and inspection related to rotating machinery in oil and gas industry.

### Course Outcome

By the end of semester, students should be able to:

CLO1: Evaluate major components, diagnosing of problems and maintenance of pump, compressor, fan, and blower. (C5, PLO1)

CLO2: Conduct experimental investigation related to various rotating equipment. (P4, PLO2)

CLO3: Able to evaluate major components, problems, and maintenance of turbo expander. (C5, PLO3)

CL04: Able to display effective leadership and teamwork skills in preparing the group project. (A5, PLO9)

BTG3333

Piping

Credit Hour: 3

Prerequisite: None

### Synopsis

The course introduces the selection of appropriate piping components and related in-service design and piping stress analysis for petro-chemical industries. The course will also review basic requirements of piping and fitting components, material selection, arrangement and piping symbols along with process flow according to P&ID diagram specifications. Students will learn the fundamentals of various design codes and industrial standards, fabrication, and certification of these components. The course incorporates basic pipe stress analysis, design principles and procedures used in the design of petrochemicals plants. Additionally, the computer laboratory sessions will also be embedded to familiarise students with design analysis of the components.

### Course Outcome

By the end of semester, students should be able to:

CLO1: Distinguish the appropriate piping types, components, size, fabrication requirement, inspection, monitoring, and piping materials based on relevant regulation, design codes and industrial standards used in oil and gas industries. (C4, PLO1)

CLO2: Evaluate the required pipe thickness and its corresponding resultant stresses in the piping and critical components. (C5, PLO3)

CLO3: Design of piping systems based on piping software to incorporate pipe modelling, joint/bolted connections and stress analysis within one platform. (P7, PLO2)

CLO4: Demonstrate the ability to formulate solution to specific problems in piping system designs along with its fabrication and inspection through technical presentation. (A3, PLO4)

### ELECTIVE COURSES FOR BTG

BTD3323

Production Planning and Control

Credit Hour: 3

Prerequisite: None

### Synopsis

This course introduces planning and control, forecasting, aggregate planning, production scheduling, just-in-time production, inventory management, material requirements planning. Simulation on production operation using Witness software is assigned.

#### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Evaluate forecasting method using qualitative and quantitative methods.
- CLO 2: Evaluate the aggregate planning using level, chase and transportation methods.
- CLO 3: Describe the best solution using Lean manufacturing and material requirement planning.
- CLO 4: Analyze a new production layout by using Witness software.

**BTD3333**  
Mechanics of Composite Materials  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course introduces students to current views and theories in polymer based composite materials, on the types of materials, production methods, quality assurance, failure analysis, test methods and the mechanics of lamina and laminated composites.

#### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Explain different types of composite materials, production methods to produce polymer matrix composites and the main properties of a lamina and the laminated of composite materials.
- CLO 2: Compare the failure modes of composites and evaluate different type of failure criteria in laminated composites, and composite materials in the future.
- CLO 3: Describe mechanical test/simulation on laminated composites.

**BTD3343**  
Fatigue Design and Analysis  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

Introduction to factors affecting fatigue behavior and characteristics of design approach. Study on cycle counting techniques. Fatigue design methods including stress life, strain life and linear elastic fracture mechanics methods under constant and variable amplitude loading.

#### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Apply fatigue design criteria.
- CLO 2: Evaluate a component under fatigue loading.
- CLO 3: Construct Finite Element Analysis for fatigue design.

**BTA3313**  
Automotive Product Development  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course introduces the concept of automotive product development process. It covers the research and development process, stages of tooling process, production line process as well as the quality system used in automotive production line.

#### Course Learning Outcome

By the end of semester, students should be able to:

- CLO 1: Explain the research and development process of automotive product and its organization.
- CLO 2: Compare the tooling process in products development based on parts function.
- CLO 3: Justify the manufacturing process flow



in car production line based on safety and human factors.

CLO 4: Identify the effect of manufacturing process on the quality of the production parts.

BTA3323

Automotive Advance Technology

Credit Hour: 3

Prerequisite: None

### Synopsis

This course is the advance construction, development and operational analysis of the state-of-the-art vehicle system which including engine advance control system for higher efficiency, lower emission, advance suspension for excellent ride and comfort, advance driveline for spacious, precision, minimum slips control, advance material for lighter, cheaper and stronger component, chassis and body, advance energy powering system for renewable and sustainability future and advance vehicle mobility control.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Compares the antilock braking, vehicle aerodynamics, tire tread design advances.

CLO 2: Combines electronically controlled anti-vibration engine mountings and transport refrigeration.

CLO 3: Differentiate electricity, alcohol, and hydrogen fuel cells, as well as advanced additives and oils, in environmentally sustainable transport.

CLO 4: Explain of engine diagnosis and troubleshooting of automotive engine control systems including digital storage oscilloscopes, fuel injection and ignition system diagnoses, five-gas exhaust analysis and emission testing. Generate Seat belts, brake lights, and air bags, of safer vehicles and fewer fatalities.

BTA3333

Energy Efficient Vehicle

Credit Hour: 3

Prerequisite: Automotive Powertrain

### Synopsis

Energy Efficient Vehicle or EEV is a new concept of categorize automotive technology towards the low fuel consumption, alternative and sustainable automotive system. Under the EEV definition, there are multiple approaches, technology, alternative fuels, materials and etc. In this course, some foundation of automotive highlighted and followed by sustainability of different green technology, electrification and detail hybrid electric vehicle design, operation, construction and diagnosis.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Evaluate the evolution of automotive electrification and technology sustainability.

CLO 2: Analyze the design of various energy efficient vehicle technology combination.

CLO 3: Summarize the architecture of different hybrid electric vehicle, safety design and influent of local policy and enforcement.

CLO 4: Analyze the construction and operation mechanism for hybrid electric vehicle low voltage, high voltage system, and its performance under different fault code driving condition.

BTA3343

Motorsport Engineering

Credit Hour: 3

Prerequisite: None

### Synopsis

This course focuses on the introduction to motorsports engineering, types of racing engines, advanced vehicle materials and structure, and manufacturing technique extant in this field. It also covers the modification as enhancement in motorsport system feature, racing theories and strategies, regulation and safety in motorsports engineering.

### Course Learning Outcome

By the end of semester, students should be able to:

CLO 1: Appraise the fundamental of motorsports engineering in the basis of racing theories, strategies, regulations, and safety.

CLO 2: Evaluate the advancement of motorsport in the aspect of advanced materials and structure usage and modification techniques.

CLO 3: Evaluate the advancement of motorsport in the aspect of manufacturing techniques utilize in the production of components and parts for motorsports.

BTG3143

Operation and Maintenance of Static Equipment (Elective)

Credit Hour: 3

Prerequisite: None

Synopsis

The course specifies the aspect of operation and maintenance of static equipment in the oil and gas/ related industries application. Static equipment covered are including furnaces, fire and unfired pressure vessel, types of valves, types of heat exchangers and its ancillary sub-system such as water treatment, steam trap and steam strainer. The part on operational contents will examine key issues relevant to the selected operations, process and flow assembly of refinery and several relevant industries. The content on maintenance part will encompass the selected predictive, preventive, or corrective types of maintenance protocols for the selected essential static equipment. Both industrial standards and safe working environment, their need and challenges, will be discussed accordingly. Finally, student will be capable to supervise, observe and manage the operation and maintenance of selected static equipment with sound justifications from the law and technological practices.

Course Outcome

By the end of semester, students should be able to:

CLO1: Differentiate operations of the selected static equipment such as furnaces, fire and unfired pressure vessel, types of valves, types of heat exchanger and its sub-system such as water treatment, steam trap, steam strainer. (C4, PLO1)

CLO2: Perform various maintenance, inspection, and testing procedures on the selected static equipment such as furnaces, fire and unfired pressure vessel, types of valves, types of heat exchanger and its sub-system such as water treatment, steam trap, steam strainer (P4, PLO2)

CLO3: Analyse methods and relevant to industrial standards and related safety concern as stipulated by OSHA Act 1994 as well as the Factories and Machineries Act 1967/13 (C4, PLO3)

CL04: Interpretation of and testing on selected static equipment based on guidelines from Factories and Machineries Act 1967/ 13 essential fittings / related 3rd parties. (A5, PLO9)

BTG3243

Prime Mover in Rotating Equipment (Elective)

Credit Hour: 3

Prerequisite: None

Synopsis

The course provides a comprehensive and in-depth discussion on rotating equipment used as industrial prime movers including reciprocating piston engine, gas turbine and steam turbine. The course also discuss topics around fundamental and working principles, sound maintenance practice and inspection related to rotating machinery relevant to the oil and gas industry.

Course Outcome

By the end of semester, students should be able to:

CLO1: Evaluate major components, problems and maintenance of reciprocating Piston Engine and Gas Turbine. (C5, PLO1)

CLO2: Conduct experiment for various type of rotating equipment. (P4, PLO2)

CLO3: Evaluate major components, problems

and maintenance of Steam Turbine. (C5, PLO3)  
CL04; Display effective leadership and team working ability in completing the group project. (A5, PLO9)

BTG3343  
Operation and Maintenance of Piping  
(Elective)  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

The course covers the aspects of specifying the fabrication activities, cutting, bevelling, metal forming and bending, maintenance, inspection and testing. Both the maintenance and inspection aspects will be discussed encompassing topics in welding, isolation, pipe and fitting, bolted flange joint, valve, strainer, painting, and insulation for the former and visual inspection, Non-Destructive Testing (NDT), painting and insulation for the latter. Testing sub-topics will explain on pipe and fittings, valves, and insulation.

#### Course Outcome

By the end of semester, students should be able to:

CLO1: Distinguish the appropriate fabrication and maintenance activities, inspection and testing for piping system based on relevant design regulation, codes and standard used in oil and gas industries. (C4, PLO1)

CLO2: Perform various maintenance, inspection and testing exercises to the piping systems. (P7, PLO2)

CLO3: Demonstrate the technical capability to formulate solution to specific problems in the piping systems including on the aspects of fabrication and inspection. (A3, PLO4)

BTG3433  
Pipeline (Elective)  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

The course elucidates the types and functions of facility and pipeline systems, their technical design considerations according to relevant design codes and standards. This is followed by discussion on the justifications for construction and pigging a pipeline, designing a pipeline system complete with programmes overseeing the maintenance and inspection exercises. In addition, the course provides reviews into pipeline engineering from the mechanical design perspective. A brief overview of pipeline operations, structural integrity assessment of the pipeline will also be discussed.

#### Course Outcome

By the end of semester, students should be able to:

CLO1: Evaluate the appropriate piping types, components, sizing, and materials based on relevant design regulation, codes and standard used in oil and gas industries. (C5, PLO1)

CLO2: Determine the required piping thickness and corresponding resultant stresses in the piping and critical components and understand piping operations, inspection, maintenance, repair strategies and assess various protection systems against in-service corrosion and abrasion. (C4, PLO3)

CLO3: Able to explain the ASME B31.3 design compendium to design the systems of piping satisfying the requirements for oil and gas sectors. (A3, PLO4)

**CURRICULUM STRUCTURE  
BACHELOR OF TECHNOLOGY IN AUTOMOTIVE WITH HONOUR**

YEAR	FIRST		SECOND		THIRD		FOURTH		
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	SM	FIRST	
COURSES	BVA1014 Automotive Industry & Technology	BVA1043 Shopfloor Supervision	BVA2013 Project Management	BVA2034 Powertrain System Service	BVA3013 Automotive Legislation	BVA3056 Quality Management	BVA3326 Final Year Project 2	BVA3412 Industrial Training	
	BVA1023 Automotive Drafting	BVA1054 Automotive Component Design & Assembly	BVA2024 Autotronic System Service	BVA2044 Capstone Technopreneurship1	BVA3024 Capstone Technopreneurship 2	BVA3314 Final Year Project 1			
	BVA1034 Automotive Workshop Practice	BVA1064 Automotive Component Fabrication	UHF1111 Mandarin for Beginner	BVA3043 Asset & Inventory Management	BVA3032 Vehicle Marketing				
	UGE2022 Technopreneurship	UQA2002 Kokurikulum	BVA2**41 Elective 1	UHF2111 Mandarin for Intermediate	BVA3073 Risk Management				
	UHS1022 Softskills	UHC2022 Penghayatan Etika dan Peradaban	BVA2**42 Elective 2	BVA2**43 Elective 3	BVA3**41 Elective 5				
	UHC1012 Falsafah dan Isu Semasa	UHL2452 English for Vocational		BVA2**44 Elective 4	BVA3**42 Elective 6				
	UHL2442 Essential English								
	<b>TOTAL CREDIT</b>	<b>19</b>	<b>17</b>	<b>16</b>	<b>20</b>	<b>20</b>	<b>10</b>	<b>6</b>	<b>12</b>
	<b>TOTAL CREDIT FOR GRADUATION</b>	<b>120</b>							

**ELECTIVE COURSE TO BE OFFERED IN  
BACHELOR OF TECHNOLOGY IN AUTOMOTIVE WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
<b>DIAGNOSE SPECIALIST</b>			
1	BVA2114	Commercial Vehicle Servicing & Maintenance	4
2	BVA2124	Drivetrain Maintenance	4
3	BVA2154	Vehicle Performance Analysis	4
4	BVA2164	Vehicle Fault Diagnosis	4
5	BVA3114	Hybrid Servicing	4
6	BVA3124	EV Servicing	4
<b>RETROFIT SPECIALIST</b>			
1	BVA2134	Surface Design	4
2	BVA2144	Automotive Modelling	4
3	BVA2174	Exterior Design	4
4	BVA2184	Component Re-Manufacturing	4
5	BVA3134	Interior Design	4
6	BVA3144	Painting	4
<b>Total Minimum Credit of Elective Subjects for Graduation</b>			<b>24</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	To produce automotive technologist that perform automotive related work including diagnostic specialist and retrofit specialist.
PEO2	To produce technopreneurs in automotive related technology.
PEO3	To produce relevant respected referred professionals in automotive technology.

**PROGRAMME OUTCOMES (PO)**

PO1	<b>Knowledge</b> Apply knowledge of technology fundamentals to broadly-defined procedures, processes, systems and methodologies in the field of automotive study
PO2	<b>Practical Skills and High Technology</b> Able to suggest and apply latest tools and techniques to solve broadly- defined problems
PO3	<b>Analytical and Critical Thinking and Scientific Approach</b> Demonstrate strong analytical and critical thinking skills to solve broadly- defined problems in the field of automotive study
PO4	<b>Communication Skills</b> Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	<b>Social and Responsibility in Society and Technologist Community</b> Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	<b>Lifelong learning and information management</b> Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	<b>Entrepreneurs and Management Skills</b> Demonstrate an awareness of management and technopreneurship practices in real perspective.

PO8	<b>Ethics and Professionalism</b> Demonstrate professionalism and social and ethical consideration
PO9	<b>Teamwork and Leadership</b> Demonstrate leadership quality, mentoring and work effectively in diverse teams

## COURSE SYNOPSIS FOR DEGREE TECHNOLOGY PROGRAMME 2021/2022

### AUTOMOTIVE TECHNOLOGY

BVA1014

Automotive Industry & Technology

Credit Hour: 4

Prerequisite: None

#### Synopsis

This course covers selected current technology in the automotive vehicle and in the automotive industry. The objective of the course is to expose on the technology utilized in the automotive industry, and to show the current and future technology in the automotive vehicle. The first part of the course covers brief history of the automotive industry, advanced driver assistance systems (ADAS), electrification in the vehicles and alternative fuels. Later in the second part, the course reveal three major component in the automotive industry which is product development flow, manufacturing and finally the distribution of the vehicles. The course will assess the cognitive, psychomotor and affective domain of the students.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Discover the current technology in automotive (C3, PLO1)

CLO2: Build skills on current systems used and their role in automotive industry (P3, PL02)

CLO3: Explain the opportunities, and challenges in the automotive industry (A3, PL04)

BVA1023

Automotive Drafting

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduced method that is used to

generate the 2D drawing and how to apply drawing dimensions, symbols, and others. The course objectives are to apply knowledge and comprehension in generating 2D drafting for technical communication purpose, and construct 2D view and generate 2D drafting with proper dimensions, tolerances and symbols, and prepare automotive components drafting for effective technical communications. The course covers drawing view preparation, Limit, Fit and Tolerances, Geometric dimensioning & tolerancing, Surface Texture and Welding Symbol, Working drawing, Introduction of 2D drafting using CAD, Drafting with CAD, Draft document preparation, and Final Project. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Module 1: Apply knowledge and comprehension in generating 2D drafting for technical communication purpose (C3, PLO1)

CLO2: Module 2: Construct 2D view and generate 2D drafting with proper dimensions, tolerances and symbols (P5, PLO2)

CLO3: Module 3: Prepare automotive components drafting for effective technical communications (A4, PLO4)

BVA1034

Automotive Workshop Practice

Credit Hour: 4

Prerequisite: None

#### Synopsis

This course aims to expose students to the function of major automotive system. This course objectives are to Classify the system of automotive workshop, display the correct automotive workshop practice, and to demonstrate good workshop practice according to standard occupational safety and health. The course covers the designation and responsibilities in Automotive Workshop, workshop compliance to rules and regulations of 4S centre, automotive workshop layouts,

automotive workshop safety and 5S, automotive tools and equipments, automotive measuring system and measuring tools, automotive fasteners, gaskets and sealants, Vehicle identification number, Automotive service procedure, Pre-servicing preparation, Post-servicing inspection, Aftersales services and customer care, and workshop waste management . The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Classify the system of automotive workshop (C3, PLO1)

CLO2: Display the correct automotive workshop practice (P3, PLO2)

CLO3: Demonstrate good workshop practice according to standard occupational safety and health. (A3, PLO5)

#### BVA1043

Shopfloor Supervision

Credit Hour: 4

Prerequisite: None

#### Synopsis

Shop Floor Supervision reviews the skills and techniques required to analyze manufacturing system and to design improved methods and layouts. The course objectives are to determine the philosophy and foundation of shopfloor supervision, to assemble the shopfloor operation using related tools, explain a good leadership and teamwork in shopfloor supervision. The course covers Key Performance Indicator (KPI) & Supervisor Behaviour, 5s and Kaizen, Safety Education & Skill Training, Job Allocation, Capacity planning and Standardized Work, Quality Assurance, Preventive Maintenance & Total Productive Maintenance (TPM), Lean Manufacturing Tools, and Project Oriented Problem Based Learning (POPBL) Consultation. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Explain the philosophy and foundation of shopfloor supervision. (C2, PLO1)

CLO2: Execute the shopfloor operation using related tools. (P2, PLO2)

CLO3: Explain a good leadership and teamwork in shopfloor supervision (A4, PLO9)

#### BVA1054

Automotive Component Design & Assembly

Credit Hour: 4

Prerequisite: None

#### Synopsis

This course introduced method that is used to construct the 2D and 3D Computer Aided Drawing (CAD) data. The course objectives are to apply knowledge and comprehension in constructing 2D sketch data for technical communication purpose, build using proper features in constructing 3D CAD data based on the actual manufacturing component design, prepare drafting of automotive components design and assembly for effective technical communications. The course covers Introduction to 3D cad, 2D Sketch, 2D Sketch manipulation, 3D Features, Assembly, Drafting and Project. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Module 1: Apply knowledge and comprehension in constructing 2D sketch data for technical communication

CLO2: Module 2: Build using proper features in constructing 3D CAD data based on the actual manufacturing component design (P5, PLO2)

CLO3: Module 3: Prepare drafting of automotive components design and assembly for effective technical communications (A4, PLO4)



BVA1064  
Automotive Component Fabrication  
Credit Hour: 4  
Prerequisite: None

#### Synopsis

The course intended to teach students to analyze the fundamental concepts of manufacturing processes in automotive, construct various skills of manufacturing techniques as an individual or a group, and comply with the manufacturing process according to detail drawing or Standard Operating Procedure (SOP). The course covers overview of manufacturing process, sheet metal shearing process, joining process, finishing process, machining process, and metal casting. The topic will assess the cognitive, psychomotor and affective domain of teaching and learning.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Analyse the fundamental concepts of manufacturing processes in automotive (C4, PLO1)

CLO2: Construct various skills of manufacturing techniques as an individual or a group. (P5, PLO2)

CLO3: Comply the manufacturing process according to detail drawing or Standard Operating Procedure (SOP) (A2, PLO8)

BVA2013  
Project Management  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This subject focuses on the principles of project management including the importance and interrelationship of all its components. The course objectives are to determine the core concepts and principles, functions, and process in project management, organise

project proposal until closing out the project, and demonstrate the capability to function effectively as members or group leader in achieving project goal. The course covers introduction: Project Management And Integration, Project Proposal, Team Planning & Project Start-Up, Organizing The Individual Project Office & Project Team, Planning & Initiating Projects, Authorizing & Controlling The Work, Schedule & Cost, Leadership skill, Reducing project duration, Managing risk and outsourcing, and Evaluating, Directing & Closing Out The Project. The topic will assess the cognitive, psychomotor and affective domain of teaching and learning  
Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Determine the core concepts and principles, functions, and process in project management (C4, PLO1)

CLO2: Organise project proposal until closing out the project (A4, PLO4)

CLO3: Demonstrate the capability to function effectively as members or group leader in achieving project goal. (A4, PLO9)

BVA2024  
Autotronic System Service  
Credit Hour: 4  
Prerequisite: None

#### Synopsis

This course started with historical review on the electronic utilization in automotive industry and electronic fundamentals as foundation. Next, this course will focus on the design and operation of automotive electrical and electronic systems in various application, especially in engine, emission, safety, communication and driveline control. Meanwhile, this course also stress on the significant of electrical system and circuits, which is importantly inter-related with automotive electronic system. Some of the key electrical system that will be included are battery construction & maintenance, charging & starting system design & services, electronic ignition system and lighting system. The

course will assess the cognitive and affective domain of teaching and learning.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Analyse the design and construction of electrical & electronics system in automotive (C4, PLO1)

CLO2: Display the functions and operations of automotive electrical and electronic systems. (P5, PLO2)

CLO3: Identify electrical and electronic system for automotive electrification. (PLO4, A4)

BVA2034

Powertrain System Service

Credit Hour: 4

Prerequisite: None

#### Synopsis

This subject focuses on powertrain service and maintenance for light vehicle unit. The objective of the study are to distinguish powertrain subsystem and detail functions, Demonstrate the knowledge and skills of vehicle diagnose, service and maintenance, and Adhere to the powertrain diagnose, service and maintenance based on standard operating procedure. The course covers various topics such as engine lubrication system, engine cooling sytem, fuel injection system, ignition system, engine combustion chamber, and intake and exhaust system. The course will asses the cognitive, psychomotor and affective domain of teaching.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Distinguish powertrain subsystem and detail functions (PLO1, C4)

CLO2: Demonstrate the knowledge and skills of vehicle diagnose, service and maintenance (PLO2, P5)

CLO3: Adhere to the powertrain diagnose, service and maintenance based on standard

operating procedure (PLO7,

BVA2044

Capstone Technopreneurship 1

Credit Hour: 4

Prerequisite: Technopreneurship

#### Synopsis

This course introduces students to the knowledge and skills in strategic planning, fundraising, negotiations, organization, and financial decision making. The course objectives are that students may sufficiently and efficiently start their enterprises through progressive stages of development and ultimately achieve optimum financial success with a highly profitable exit. The course prompts students to think finance and strategy in a holistic manner and within the appropriate context by learning from experts and listening to talks from successful business owners about various stages typical entrepreneurs face from incubation to exit. The course will assess the affective domain of the student.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Develop creativity, innovative mindset, courage to take calculated risks and actions upon opportunities as the foundation of entrepreneurship culture in mobility related business (PLO6, A2, Lifelong Learning & Information Management)

CLO2: Explain flexible and facilitative governance, regulation and funding to facilitate exploration into entrepreneurship (SME) (PLO7, A4, Technopreneurship & Management Skills)

CLO3: Propose (Pitch) ideas on creating high-growth enterprises and the use of latest technology in marketing (PLO9, A5, Teamwork & Leadership)

BVA3024

Capstone Technopreneurship 2

Credit Hour: 4

Prerequisite: Technopreneurship Capstone 1

## Synopsis

This course introduces students to the technology and skills required of future entrepreneur to achieve breakout performance as technology and business have joined forces to co-create value, hence technology and skills have conspired to require a new kind of entrepreneurial mindset. The course objectives are that students are expected to acquire knowledge and skills that will enable them to gain a competitive edge and exceed goals in business. The course offers a non-technical, broadoverview of new technologies that are impacting companies across multiple industries stressing on advancement in technologies which is an essential topics for business owners, managers and executives who seek to understand the technologies that drive business transformation and how to implement them to drive transformation in their organisation. The course will assess the affective domain of the student.

## Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Explain emerging technologies and their business applications (PLO6, A4, Lifelong Learning and Information Management)

CLO2: Formulate new business solutions that are enabled by modern tools and technologies (PLO7, A4, Technopreneurship and Management Skills)

CLO3: Propose innovations that build on existing business infrastructure that are enabled by advances in technologies (PLO4, A5, Communication Skills)

BVA3032

Vehicle Marketing

Credit Hour: 2

Prerequisite: None

## Synopsis

This course introduces students to the fundamentals of vehicle marketing and how

they may be applied to entrepreneur technologies. The course objectives are to explain how to use technology into strategic marketing and analyze the various marketing management activities and their roles. The course covers analysing marketing environment, financial strategy, competitive strategy and analysis, vehicle's import regulation, and marketing strategy. The course will assess the cognitive and affective domain of the teaching and learning

## Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Identify the technology relates to strategic marketing to help entrepreneurs develop new business prospects. (PLO1,C4)

CLO2: Analyze the various marketing management activities and their roles in enhancing entrepreneur technology-based industry competitiveness, as well as produce a marketing plan report. (PLO7, A5)

BVA3013

Automotive Legislation

Credit Hour: 3

Prerequisite: None

## Synopsis

This course provides the students with the basic knowledge and theory regarding legislative on every aspect related to automotive aspects. The course objectives are to describe the Automotive standard available in the world and National Automotive Policy, Interpret vehicle safety requirement related to Malaysian Road Safety, and Explain the vehicle inspection requirement. The course covers the Automotive standards in the world, Malaysian perspective on automotive, Malaysia and regional automotive policy, Malaysia Standard, Vehicle Safety, and vehicle inspection. The course will assess the affective domain of teaching and learning

## Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Describe the Automotive standard available in the world and National Automotive Policy (PLO1,C5)

CLO2: Interpret vehicle safety requirement related to Malaysian Road Safety (PLO5, A5)

CLO3: Explain the vehicle inspection requirement (PLO6, A4)

BVA3043

Asset and Inventory Management

Credit Hour: 3

Prerequisite: None

#### Synopsis

This subject focuses on the role of warehouse and inventory management specifically for automotive industry. This module is run as Work Based Learning at the selected industry

**Course Learning Outcomes**

By the end of semester, students should be able to:

CLO1: Describe the role of warehousing (C4, PL03)

CLO2: Explain strategic framework for logistic and inventory management (P4, PL02)

CLO3: Present the best practices of maintenance and asset management. (A2, PL07)

BVA3056

Quality Management

Credit Hour: 6

Prerequisite: None

#### Synopsis

This course provides a useful insight into concept, theories and application of quality management in an organization. Student will be introduced to tools and techniques of quality that are useful for practice, people and process improvement. This also includes approaches for planning, controlling and improving the quality management function of a system. Quality is a universal concept, its application and management encompasses a wide variety of field. Therefore, this course

is suitable for individuals who aspire to be managers in their organizations in future regardless of their area of specialization.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Explain the basic quality principles and practices, quality solving techniques and product reliability related to manufacturing process (C2, PLO1)

CLO2: Solve the manufacturing process quality problem using appropriate problem solving techniques (P4, PLO2)

CLO3: Perform the ability to apply the quality control tools (A2, PLO4)

BVA3063

Risk Assessment

Credit Hour: 3

Prerequisite: None

#### Synopsis

Factors such as appropriate selection of personnel, adequate provision of training and thorough consideration of occupational safety and health issues all help to reduce the incidence of injury and illness resulting from inadequate examination of potential hazards, poor ergonomic design, equipment failure, defective products or hazardous materials. The working environment, suitability of equipment and the competencies of staff all have to be considered in the context of legislative requirements and good management of health and safety. This document presents a structured approach to good management of safety and describes a universal framework for task or activity planning. It defines steps and processes which, if used as a common reference, will simplify and unify our management of health and safety risk and streamline our approach to planning tasks and activities.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Determine and apply knowledge of complex risk assessment theory to your professional practice and/or further study. (C4, PLO3)

CLO2: Apply logical, critical and creative thinking to analyse, synthesise and apply theoretical knowledge, and technical skills, to formulate evidenced based solutions to industry problems or issues. (P4, PLO2)

CLO3: Collaborate effectively with others and demonstrate intellectual independence and autonomy to solve problems and/or address industry issues and imperatives. (A3, PLO9)

BVA3314

Final Year Project 1

Credit Hour: 4

Prerequisite: None

#### Synopsis

The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Explain the problem, objectives and scope of project associated to the industrial or community needs. (C2, PLO1)

CLO2: Use relevant theory to produce solution. (P4, PLO2)

CLO3: Present the preliminary findings in the oral and written forms effectively (A3, PLO4)

BVA3326

Final Year Project 2

Credit Hour: 6

Prerequisite: Final Year Project 1

#### Synopsis

This is the second part of the Bachelor Degree Project. Students are expected to continue the project performed in Bachelor Degree Project until completion. At the end of the semester, students are required to submit the Bachelor Degree Project report and present their projects for assessment.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Analyze data in a meaningful form using relevant tools. (C4, PLO3)

CLO2: Perform project implementation systematically. (P4, PLO2)

CLO3: Present the results in the oral and written forms effectively. (A3, PLO4)

BVA3412

Industrial Training

Credit Hour: 12

Prerequisite: None

#### Synopsis

Industrial training is a compulsory component for degree program students at Universiti Teknikal Malaysia Melaka (UTeM). The experience and skills acquired from a period of placement can be invaluable and provide the advantage to the students when applying for employment after graduation. During the training period with the relevant industry, students are expected to involve in the following areas of training in order to achieve the underlying objectives: Manufacturing, production process and / or its optimization process, mechanical design and product, maintenance and repair of equipments, product testing and quality control.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Solve technology related problems using methods, tools and techniques learnt throughout the training (PLO3, C3)

CLO2: Explain effectively with the technical community and produce technical reports and presentations. (PLO4,A4)

CLO3: Demonstrate social ethique and professionalism in technology practice. (PLO8,A3)

## BVA ELECTIVE COURSES

### BVA2114

Commercial Vehicle Servicing & Maintenance

Credit Hour: 4

Prerequisite: None

#### Synopsis

This course covers selected systems that needs schedule and unscheduled maintenance and service for the heavy duty vehicles as the commercial vehicles. The objective of the course is to expose on the technology utilized in the heavy duty vehicles, including the rules and regulations in maintenance and service of commercial vehicles systems. The course start with a brief overview of the systems in the heavy duty vehicles. Later, the course covers selected systems such as; engine, emission, transmission, hydraulic and pneumatic brakes, tire. The course will assess the cognitive, psychomotor and affective domain of the student.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Discover the current and future technology in the commercial vehicle system (C4, PLO1)

CLO2: Organize various skills of servicing and repair as an individual or a group. (P5, PLO2)

CLO3: Integrate the servicing and maintenance according to Standard Operating Procedure (SOP) (A4, PLO8)

### BVA2124

Drivetrain Maintenance

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course introduces students to the drivetrain system including transmission, wheels, suspension and steering. The course objectives are to identify components and function in various drivetrain system, perform tests and troubleshooting for faults detected in drivetrain system and explain the concept and the working principles of advanced drivetrain system. The course covers conventional, current and advanced technology in transmission, wheels, suspension and steering. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Identify components and function in various drivetrain system (C4, PL01)

CLO2: Construct plan for testing and troubleshooting for faults detected in drivetrain system (P5, PLO2)

CLO3: Explain the concept and the working principles of advanced drivetrain system (A4, PLO4)

### BVA2134

Surface Design

Credit Hour: 4

Prerequisite: None

#### Synopsis

The course introduced surfacing method that is used to construct the 3D CAD data which usually applied in industrial field. The course objective are to make sure students able to identify knowledge and comprehension in constructing surfacing data, demonstrate the proper features to use in constructing surfacing data and prepare surfacing data from the scanning data of automotive vehicles or components. The course covers the suitable features in constructing industrial design surfacing which will be applied which

helps producing the quality and efficiently surfaces data data for technical communication purpose. The course will assess the cognitive, psychomotor and affective domain of students via assignment, test and project given. The project allowed students to construct the 3D CAD data of automotive vehicle or component using surfacing module with quality verification.

#### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Identify knowledge and comprehension in constructing surfacing data for technical communication purpose  
 CLO2: Demonstrate the proper features to use in constructing surfacing data which emphasize the quality aspect (P5,  
 CLO3: Prepare surfacing data from the scanning data of automotive vehicles or components (A4, PLO4)

BVA2144  
 Automotive Modelling  
 Credit Hour: 4  
 Prerequisite: None

#### Synopsis

This course provides the knowledge and skills regarding physical modelling process in automotive design development. The course objectives are to analyse appropriate physical techniques for building automotive components, construct 3-Dimensional physical model using proper tools, equipments and materials, and organize systematic workflow and process in completing modelling task. The course covers tools and equipment in modelling, materials in physical modelling, package and cross section drawing, casting for automotive component, clay modelling Fiber glass fabrication, laser cutting, vacuum forming Process, and CNC application in model making, and Labels and Decals. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Analyse appropriate physical techniques for building automotive components (C4, PLO3)  
 CLO2: Construct 3-Dimensional physical model based suitable data using proper tools, equipments and materials (P5,  
 CLO3: Organize systematic workflow and process in completing the task that have been given (A4, PLO9 )

BVA2154  
 Vehicle Performance Analysis  
 Credit Hour: 2  
 Prerequisite: None

#### Synopsis

This subject introduce the method for vehicle performance analysis. The objective of the subject are to distinguish vehicle performance analysis method and performance parameters, analyse the vehicle performance based on analytical and measurement method, and adapt the engine and chassis dynamometer for engine performance test. The topics covered are method of performance analysis, engine performance parameters, engine testing and test facilities, torque and power measurement and analysis, emission testing and analysis, fuel consumption testing and analysis, and other vehicle testing in industry. The course assess the cognitive, psychomotor and affective domain of teaching.

#### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Distinguish vehicle performance analysis method and performance parameters (PL01, C4)  
 CLO2: Analyse the vehicle performance based on measurement and data analysis (PL03, C4)  
 CLO3: Adapt the engine and chassis dynamometer for engine performance test and tuning. (PL02, P6)

BVA2164  
 Vehicle Fault Diagnosis  
 Credit Hour: 4  
 Prerequisite: None

### Synopsis

This course introduces the vehicle fault and diagnostic tools and technique. The course objectives are to analyse the various diagnostic tools and method used to check vehicle performance systems ( drivetrain, powertrain and electrical components), Organise proper method to diagnose vehicle system (drivetrain, powertrain and electrical components), and explain the precaution and methodology during diagnostic. The course covers topic such as Identify and justify diagnosis specification, Diagnosis specifications, Test equipment, Fault diagnosis, symptoms, Factors that contribute to diagnosis, Workshop testing, and Diagnostic techniques. The course assess the cognitive, psychomotor and affective domain of teaching and learning

### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Analyse the various diagnostic tools and method used to check vehicle performance systems ( drivetrain, powertrain and electrical components). (C4, PLO1)

CLO2: Organize proper method to diagnose vehicle system (drivetrain, powertrain and electrical components). (P4, PLO2)

CLO3: Explain the precaution and methodology during diagnostic the vehicle system (drivetrain, powertrain and electrical components). (A4,PLO4)

BVA2174  
 Exterior Design  
 Credit Hour: 4  
 Prerequisite: None

### Synopsis

The course provides students with the knowledge and skills regarding designing an exterior part of the vehicle. The course objectives are to make sure students enable to identify and construct car exterior components based on appropriate car package and segmentation with consideration of design for safety. The course covers the concept of car exterior design and its regulations and how to develop it using CAID till simulation and visualization stages. The course will assess the cognitive, psychomotor and affective domain of student via assignments, test and project.

### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Identify the concept of exterior components and its regulations (PL01, C4)

CLO2: Construct car exterior components based on appropriate car package and segmentation. (PL02, P5)

CLO3: Explain the car exterior components with consideration of design for safety. (PL05, A4)

BVA2184  
 Component Remanufacturing  
 Credit Hour: 4  
 Prerequisite: None

### Synopsis

This course introduced method that is used to restore automotive components that is already discontinued from the markets or end of life. The course objectives are to construct the existing component using 3D scanning and 3D printing method, analyse and suggest suitable method and material for remanufacturing and integrate the teamworking and leadership skill in reconstruction. The course covers topic such as 3D scanning, additive manufacturing, fused deposition modelling, 3D printing and its related parameter, and reconstruction project. The course will assess the cognitive, psychomotor and affective domain of the student.



## Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Construct the existing component using 3D scanning and 3D printing method. (P5, PLO2)

CLO2: Analyze and suggest suitable method and material for remanufacturing the component. (C4, PLO3)

CLO3: Integrate teamworking and leadership skill in reconstructing the part. (A4, PLO9)

BVA3114

Hybrid Servicing

Credit Hour: 4

Prerequisite: None

### Synopsis

Hybrid Servicing introduces the knowledge and skills technology on hybrid vehicle services and maintenance. At the end of the course, the students should be able to explain the functions and operations of hybrid powertrain system and components, construct various skills of servicing and repair as an individual or a group, and perform the servicing and maintenance according to Standard Operating Procedure. The course covers hybrid vehicle inspection, energy storage system servicing, power electronic system servicing, supporting subsystem servicing and hybrid supervisory function. The course will assess the cognitive, psychomotor and affective domain of teaching and learning

## Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Designate the functions and operations of hybrid powertrain system and components (C4, PLO1)

CLO2: Construct various skills of diagnose, service and maintenance of hybrid vehicles (P5, PLO2)

CLO3: Perform the servicing and maintenance according to Standard Operating Procedure (SOP) (A5, PLO8)

BVA3124

EV Servicing

Credit Hour: 4

Prerequisite: None

### Synopsis

This course introduces the fundamentals of electric vehicle components, systems and its general services. The objective of this course are to analyse the vehicle's system and functions, demonstrate the fault diagnosis and service skills and preparing EV standard servicing procedure. The students will be introduced to the EV safety standard practice, powertrain system, energy storage, EV faults and diagnosis, service and maintenance, and standard servicing procedure. The course will assess the cognitive, psychomotor and affective domain of the students.

## Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Analyse the function of each component and the system on Electric Vehicle (C4, PLO3)

CLO2: Demonstrate the experiment to check the fault on EV and do a service accordingly (P4, PLO2)

CLO3: Prepares the Standard of Operating Procedures (SOP) when conducting a service on EV (A4, PLO8)

BVA3134

Interior Design

Credit Hour: 4

Prerequisite: None

### Synopsis

This courses provides the knowledge and skills regarding designing an interior components of the vehicle. The course objectives are to describe the concept of interior components and its regulations, construct and establish the car interior components with consideration of design for

safety, and Explain the car exterior components with consideration of design for safety. The course covers Introduction to Automotive Interior Design, Cargo, Volume and Car Segmentation, Car Package and Applied Ergonomics, Interface Design - HMI, Instrument Panels and Consoles, Automotive Conceptual Development, Car Interior Design Development using CAID, Introduction to Interior Design Simulation and Visualization and Quality Inspection. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Evaluate the concept of interior components and its regulations (C4, PLO1)

CLO2: Construct and establish the car interior components with consideration of design for safety. (P5, PLO2)

CLO3: Explain the car exterior components with consideration of design for safety. (A4, PLO4)

BVA3144

Painting

Credit Hour: 4

Prerequisite: None

#### Synopsis

This courses aims to introduce the process and technique of automotive painting. The course objectives are to describe the concepts and methodologies of automotive painting process, technology and materials in industrial practice, apply correct procedures for painting, wrapping or water transfer, and demonstrate a good teamwork in completing projects. The course covers Introduction to OEM painting proces, Surface and Materials preparation, Automotive Painting Works, Quality Inspection, Sticker Wrapping, and Water Transfer. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Identify the concepts and methodologies of automotive painting process, technology and materials in industrial practice. C4,PLO1

CLO2: Organise correct procedures for painting, wrapping or water transfer. P5,PLO2

CLO3: Integrate a good teamwork in completing projects. A4,PLO9

## CURRICULUM STRUCTURE DIPLOMA IN MECHANICAL ENGINEERING

YEAR	1				2		
COURSES	UHC2022 Penghayatan Etika dan Peradaban	DRM1113 Engineering Drawing & CAD	DRM1413 Manufacturing Technology	DRM2423 Hydraulics & Pneumatics Technology	DRM2313 Fluid Mechanics	DRM2910 Industrial Training	
	DUF1113 Physics	DRM1213 Engineering Materials	DRM1513 Electrical and Electronic Technology	DRM2122 Industrial Design	DRM2133 Mechanical Design	UQB1012 Co-curriculum	
	DUM1113 Basic Mathematics	DRM1223 Statics	DRM1233 Dynamics	DRM2243 Solid Mechanics	DRM2323 Thermodynamics		
	UHL2442 Essential English	DRM1711 Mechanical Technology Lab 1	DRM1721 Mechanical Technology Lab 2	DRM2432 Occupational Safety & Health	DRM2443 CNC Technology		
		DRM1613 Metrology	DRM1523 Computer Programming		DRM2622 Mechanical Measurement and Instrumentation		
		JHS1022 Soft skills	JHC1012 Falsafah dan Isu Semasa		DRM2814 Final Year Project		
		DUM1123 Calculus	DUM2413 Statistics & Probability		UGE1002 Entrepreneurship		
		UHL2412 English for Academic Communication	UHL2432 English for Professional Communication				
		20	20	10	20	12	
	TOTAL CREDIT PER SEMESTER	10	20	20	10	20	12
	92	OVERALL TOTAL CREDIT FOR GRADUATION					

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO 1	Cognitive- To gain and apply knowledge in the field of Mechanical Engineering.
PEO 2	Psychomotor - To possess practical and communication skills in the working environment.
PEO 3	Affective - To become a holistic person with professionalism, ethical and high integrity.

**PROGRAMME LEARNING OUTCOMES (PLO)**

PLO 1	Knowledge of Discipline Areas – Demonstrate knowledge and understanding of the theory and principles of the field-of-study on well-defined procedures and practices.
PLO 2	Practical Skills – Apply appropriate techniques, skills and tools in the practices of studied field to resolve well-defined problems.
PLO 3	Problem Solving and Scientific Skills – Identify well-defined problems and produce innovative solutions that comply with principles of the field-of-study.
PLO 4	Communication Skills – Communicate effectively within a wide range of audiences including social, academic and professional through oral, visual and written skills purposes.
PLO 5	Social Skills and Responsibilities – Demonstrate social skills and responsibilities in recognition and acceptance of individual, society and cultural diversity to the extended well-defined technology practices.
PLO 6	Information Management and Lifelong Learning Skills – Research, explore, learn and use new technology to acknowledge the requirement of career establishment and to employ independent continuing learning in specialized technical knowledge.
PLO 7	Technopreneurship and Management Skills – Apply consciousness of management and technopreneurship routine in real perspective.
PLO 8	Ethics and Professionalism – Demonstrate behaviours that are consistent with professional standards and ethical responsibilities.
PLO 9	Teamwork and Leadership Skills – Function effectively as a team member with leadership character in diverse technical teams.

## **COURSE SYNOPSIS DIPLOMA OF MECHANICAL ENGINEERING**

DRM1523  
Computer Programming  
Credit Hour: 3

### Synopsis

This course formally introduces the concept of computers, algorithms, problem solving, and programming languages. The programming language introduced in this course is C. Students will use the C language programming to solve simple mechanical engineering problem.

### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Construct C program that utilizes standard input output operations, variables, arithmetic operation, and math functions.
- CLO2: Apply C program that utilizes control structure, looping, functions, and numeric arrays to solve Mechanical Engineering problems.

DRM1113  
Engineering Drawing & CAD  
Credit Hour: 3

### Synopsis

This subject is design to teach engineering drawing to the student using drawing tools such as free hand drawing, instrument drawing & Computer Aided Design Drawing (CAD) software. This will include from beginning to intermediate level of CAD. Student should be able to draw 2D as well as 3D drawing standard upon complete this course.

### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Explain a knowledge in engineering drawing principles and standard practice using drawing tools.
- CLO2: Apply the orthographic view, section view, auxiliary view, isometric views and tolerances in engineering drawings to solve visualization problem.
- CLO3: Interpret blue print of working drawing.
- CLO4: Apply knowledge and techniques to create standard drawing relating to design engineering by using 2D CAD software
- CLO5: Apply knowledge and techniques to create standard drawing relating to design engineering by using 3D CAD software

DRM1513  
Electrical & Electronic Technology  
Credit Hour: 3

### Synopsis

This course introduces fundamental of electric circuit, circuit network analysis, inductance and capacitance. The electronics technology involved with basic understanding of usage and application of semiconductor devices: diodes, transistor, and digital logic circuits.

### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Apply knowledge of basic electrical circuit and semiconductor devices in mechanical engineering.
- CLO2: Construct electrical circuit based on basic electrical and electronic knowledge.
- CLO3: Solve mechanical engineering problem involving basic electrical and electronic.

DRM1213  
Engineering Materials  
Credit Hour: 3

### Synopsis

This course introduces the engineering materials application, atomic bonding, crystal structure, mechanical and physical properties, microstructure, phase diagram, ferrous and non-ferrous alloys, polymer and advance

materials.

### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Explain the materials' atomic bonding and crystal structure.

CLO2: Prepare the mechanical testing to investigate the mechanical properties of engineering materials.

CLO3: Relates microstructures of alloys with phase diagram

CLO4: Distinguish the microstructure, properties and applications of ferrous and non ferrous alloys.

CLO5: Explain the polymeric and advanced materials classification, structure and properties.

CLO6: Demonstrate material selection process, with focus on selecting materials that optimize product performance, reliability and cost.

### DRM1223

Statics

Credit Hour: 3

### Synopsis

This course is an introduction to solving engineering static problems involving force vector, equilibrium of particle and rigid body in structures, frame and machines, friction effect on rigid body equilibrium, centroids, center of gravity and moment of inertia.

### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Solve equilibrium of particle using scalar method and vector notation

CLO2: Solve equilibrium of rigid body in structure, frame and machine problems

CLO3: Solve equilibrium of rigid body involving friction and structure

CLO4: Compute centroid, center of gravity and moment of inertia of composite cross sectional area

### DRM1711

Mechanical Technology Laboratory 1

### Synopsis

This course introduces students with safe working habits, reading blueprints, identification, care and use basic measuring instruments, layout methods & basic hand tools. Emphasis is placed on operation of drill press, lathe, pedestal grinder and grinding operations..

### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Explain the fundamentals of safety and regulation in mechanical lab

CLO2: Apply bench work and drilling operation

CLO3: Apply various basic turning operations

CLO4: Apply grinding process

CLO5: Respond to team members in completing task

### DRM1721

Mechanical Technology Laboratory 2

Credit Hour: 1

### Synopsis

The course provides students hands-on experience of milling operations using conventional milling machine, welding operations using different types of welding equipments including electrode, MIG, TIG and spot weld and basic application of sheet metal fabrication.

### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Explain various basic conventional milling operations.

CLO2: Apply various welding operations using different types of welding

CLO3: Apply basic application of sheet metal fabrications.

CLO4: Respond to team members in completing task

DRM1613  
Metrology  
Credit Hour: 3

#### Synopsis

This course covers the engineering measuring instruments such as micrometer, Vernier caliper, mechanical dial indicator, gauge block, surface plate, instruments of testing angles and gauges. Additionally, we will cover the principle of surface metrology and roundness measurement. Lastly, we will learn the relationship between drawing dimensions and the measurement parts, aspect of accuracy, precision and measurement errors.

#### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Apply the fundamental of metrology, measurement errors and basic inspection by utilizing various methods and techniques.
- CLO2: Demonstrate linear and angular measurements and inspection by using various measurement instruments.
- CLO3: Apply the principles of surface metrology in order to calculate surface roughness by various methods.
- CLO4: Understand the principles of roundness measurement by various methods.

DRM2243  
Solid Mechanics  
Credit Hour: 3

#### Synopsis

This course introduces the concept of stress and strain under axial loading, torsion, pure bending, and analysis and design of beam for bending.

#### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Compute the simple stress problems in

load-bearing structures.

CLO2: Estimate the stresses and strains in structural members subjected to axial loads.

CLO3: Solve the circular shafts subjected to twisting couples or torques.

CLO4: Calculate the stresses in beams subjected to pure bending.

CLO5: Solve the stresses in beams subjected to transverse loading by using shear force and bending moment diagram.

DRM1233  
Dynamics  
Credit Hour: 3

#### Synopsis

This course introduces kinematics of particles, kinetics of particles utilizing force and acceleration principles, kinetics of particles utilizing work and energy principles and kinetics of particles utilizing impulse and momentum principles.

#### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Solve kinematics of particle problem
- CLO2: Solve kinetics of particle problem utilizing force-acceleration principles
- CLO3: Analyse kinetics of particle problem utilizing work-energy principles
- CLO4: Analyse kinetics of particle problem utilizing impulse and momentum principles

DRM2313  
Fluid Mechanics  
Credit Hour: 3

#### Synopsis

This course introduces properties of fluids, fluid statics, fluid in motion, flow measurement, friction in fluid flow and pumps & pumping.

#### Course Learning Outcomes

By the end of semester, students should be able to:

- CLO1: Solve fluids properties and fluids

statics problems

CLO2: Apply concept of fluid in motion and solve the problems involving flow measurements and friction

CLO3: Analyze the concept flow, work and pump to the typical problems

DRM2323

Thermodynamics

Credit Hour: 3

Synopsis

This course includes a study of properties of a system, properties of pure substance, first law and second law of thermodynamics and entropy

Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Apply the basic concepts of thermodynamics and properties of pure substances to the typical problems

CLO2: Solve the problems involving first law, second law, and entropy changes of thermodynamics systems

CLO3: Display teamwork ability through solving and presenting thermodynamics complex problems

DRM2122

Industrial Design

Credit Hour: 2

Synopsis

This course cover several aspects related to product design and industrial design. The aspects covered are product planning and customer needs, product specification, concept generation and concept selection, industrial design, design of environment and design of engineering.

Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Apply the understanding of customer needs and product design specification in concept generation

CLO2: Produce a 3D design product by using Solidwork software

CLO3: Relate DFM and DFE with quality of product

CLO4: Build a positive communication within group members to present the project work

DRM1413

Manufacturing Technology

Credit Hour: 3

Synopsis

This course introduces the student to various types of manufacturing processes used for converting raw material into finished products. This course will cover basic principles in metal casting processes, plastics processes, metal and sheet metal forming processes, powder metallurgy processes, materials removal processes, rapid prototyping and joining processes. Student will construct and present a process flow to manufacture a conceptual product.

Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Explain different types of manufacturing processes

CLO2: Apply different types of manufacturing processes

CLO3: Construct and present a process flow to manufacture a conceptual product

DRM2432

Occupational Safety & Health

Credit Hour: 2

Synopsis

This course introduces OSH in Malaysia, identification, types and inspection of



industrial hazard, analysis and control of industrial hazard, mechanical hazard, chemical hazard, physical hazard, psychosocial hazard, industrial hygiene and diseases, accident causation phenomenon, accident investigation and analysis, managing safety and health, and industrial safety and health regulation.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Demonstrate the OSHA regulation and implementation in Malaysia

CLO2: Explain the industrial hazards and industrial hygiene

CLO3: Analyse the accident phenomenon

DRM2423

Hydraulics & Pneumatics Technology

Credit Hour: 3

#### Synopsis

This course introduces hydraulic and pneumatic systems, actuators, sensors, valves and accessories. This course also introduces the design, analysis and simulation method of hydraulic and pneumatic system. Electromechanical control and programmable logic control of hydraulic/pneumatic system are introduced to enhance the hydraulic and pneumatic system design.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Understand basic hydraulic/pneumatics components and circuits

CLO2: Analyze basic hydraulic/pneumatics components and circuits

CLO3: Analyze electro-hydraulic/pneumatics components and circuits

CLO4: Assemble and test actual electro-hydraulic/pneumatics systems

CLO5: Produce and simulate actual electro-hydraulic/pneumatics system model using software

DRM2443

CNC Technology

Credit Hour: 3

#### Synopsis

This course introduces the student to modern manufacturing processes which focused on CNC machining technology. This course will teach manual CNC programming and simulation using CNC simulator. This course will also cover troubleshooting for common programming errors. Student will construct a CNC program to manufacture a workpiece according to a technical engineering drawing.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Construct CNC programme for CNC milling machine

CLO2: Construct CNC programme for CNC lathe machine

CLO3: Apply CNC programme to develop a CNC project

CLO4: Constructs and present a CNC project

DRM2133

Mechanical Design

Credit Hour: 3

#### Synopsis

This course introduces simple design process of machine components for static and dynamic loading. Machine elements design including screws, bolts, nuts, welded joints, springs and shafts.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Identify static failure on structures and fatigue failure on shafts.

CLO2: Select the helical compression springs.

CLO3: Determine the non-permanent joints including bolts, nuts and screws.

CLO4: Analyse the welding in torsion and bending.

DRM2814  
Final Year Project  
Credit Hour: 4

#### Synopsis

This course involves the project assignment to the students concerning selected topics related to the mechanical engineering. The technical project requires a particular design of appropriate equipment/system, development of the manufacturing process, testing and analysis of the system or equipment, preparation and presentation of the project report.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Deconstructs a project and its development process based on proper knowledge of engineering and current practices of engineering tools.

CLO2: Prepares the project report in both writing and oral communication with regard to ethical and professional practices in technology and engineering.

CLO3: Organizes techniques for literature review and independently formulates the gather information towards of accomplishment of the project

CLO4: Perform entrepreneurship knowledge in managing projects by considering cost effectiveness, practicality, and marketability.

DRM2910  
Industrial Training  
Credit Hour: 10

#### Synopsis

This training exposes the students to professional skills and experience. The exposure will help to produce an excellent, responsible and good attitude.

#### Course Learning Outcomes

By the end of semester, students should be able to:

CLO1: Apply and practice basic professional

engineering knowledge/skills at industry level.  
CLO2: Identify and solve the industrial problem using available or learnt modern tools such as CAD, CNC machine etc.

CLO3: Analyse and solve the industrial problems such as planning, design, construction and management of the projects.  
CLO4: Build communication/presentation skill when dealing with colleagues at industry.

CLO5: Identify the company or department structure and recognize the job scope of specific post in the organization.

CLO6: Explain the industrial training at industry in a complete report by end of the industrial training program.

CLO7: Organize/manage a small group of people for special task/assignment



# FACULTY OF INDUSTRIAL SCIENCES AND TECHNOLOGY

COURSE INFORMATION 2022-2023

## CURRICULUM STRUCTURE BACHELOR OF APPLIED SCIENCE IN INDUSTRIAL BIOTECHNOLOGY WITH HONOURS

YEAR SEM	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
FACULTY & PROGRAMME COURSES	UHC2022 Penghayatan Etika Dan Peradaban	UHL2312 Technical English	UQB1011 Co-Curriculum I	UHS1011 Soft Skills I	UHF2**1 Foreign Language II	BSB3163 Plant and Mammalian Cell Technology	BSB4173 Extraction and Bioseparation	BSB4812 Industrial Training
	UHC1012 Falsafah Dan Isu Semasa	BCS1023 Programming Techniques	UHL2322 Technical Writing	UQ*20** Co-Curriculum	UHS1011 Soft Skills II	BSB3492 Plant and Mammalian Cell Technology Laboratory	BSB4422 Extraction and Bioseparation Laboratory	
	BUM2123 Applied Calculus	BUM24113 Applied Statistics	BSF2112 Industry Quality Management	UHF1**1 Foreign Language I	UHL2332 Academic Report Writing	BSB3312 Final Year Project I	BSB4324 Final Year Project II	
	BSF1222 Industry Safety Management	BSB1173 Microbiology Laboratory	BSB2133 Cell and Molecular Biology	BSB2143 Enzyme Technology	BSB3113 Gene Technology	BSB35*3 Elective I	BSB35*3 Elective III	
	BSB1113 Biochemistry Laboratory	BSB1432 Microbiology Laboratory	BSB2472 Cell and Molecular Biology Laboratory	BSB2452 Enzyme Technology Laboratory	BSB3472 Gene Technology Laboratory	BSB35*3 Elective II		
	BSB1402 Biochemistry Laboratory	BSB1133 Organic Chemistry Laboratory	BSB2173 Bioanalytical Chemistry	BSB2193 Industrial Microbiology Laboratory	BSB3123 Bioprocess Technology	UGE2002 Techno- Preneurship		
	BSB1102 Biophysical Chemistry Laboratory	BSB1412 Organic Chemistry Laboratory	BSB2442 Bioanalytical Chemistry Laboratory	BSB2462 Industrial Microbiology Laboratory	BSB3482 Bioprocess Technology Laboratory			
	BSB1112 Industrial Biotechnology		BSB2122 Genetics	BSB2223 Laboratory Quality Management & Validation	UHE33**2 Elective CMHLS			
				BPO1223 Principles of Operation Management				
	TOTAL CREDIT FOR GRADUATION	18	18	18	18	16	15	12
	127							

## ELECTIVE COURSES FOR BACHELOR OF APPLIED SCIENCE IN INDUSTRIAL BIOTECHNOLOGY WITH HONOURS

NO.	CODE	COURSE	CREDIT HOUR
1	BSB3503	Biomanufacturing	3
2	BSB3513	Immunotechnology	3
3	BSB3523	Bionanotechnology	3
4	BSB3533	Biopharmaceutical	3
5	BSB3543	Nutraceuticals and functional foods	3
6	BSB3553	Bioinformatics	3
7	BSB3563	Bioremediation	3
8	BSB3573	Reactor design	3
9	BSB3583	Advanced enzyme technology	3
10	BSB3593	Biosensor technology	3
11	BSB3703	Microbial genomics	3
Total minimum credits of elective courses for graduation *Students are compulsory to take THREE (3) elective courses during the study			9

### PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1	<b>Synthesize and apply the knowledge of technology-based sciences and laboratory experiences to provide quality products and services to the bio-based industry locally and globally</b>
PEO2	<b>Communicate effectively in leading and engaging multidisciplinary teams while addressing relevant issues locally and globally</b>
PEO3	<b>Explore business opportunities in the bio-based industry locally and globally and utilize ICT to advance their biotechnological knowledge and skills</b>
PEO4	<b>Integrate ethical and professional values in managing and providing services to the recipients and providers of the bio-based industry locally and globally</b>

### PROGRAMME OUTCOMES (PO)

PO1	<b>Acquire and apply knowledge relevant to biotechnology</b>
PO2	<b>Operate and maintain a range of biotechnology instruments</b>
PO3	<b>Analyse, synthesize, integrate knowledge and information to provide solutions in addressing challenges and concerns, appropriate to biotechnology</b>
PO4	<b>Conduct basic guided research</b>
PO5	<b>Communicate ideas scientifically, in verbal and written forms, with communities</b>
PO6	Deliver responsibilities and demonstrate good interpersonal skills in a team.
PO7	<b>Manage information and engage in life-long learning</b>
PO8	<b>Manage laboratory and industrial occupational safety and quality</b>
PO9	<b>Explore business opportunity pertaining to the field of industrial biotechnology</b>
PO10	<b>Demonstrate understanding and awareness of basic commercial, ethical, legal and social issues related to biotechnology</b>
PO11	<b>Lead and work efficiently in a multidisciplinary projects team</b>

**COURSE SYNOPSIS****COURSE SYNOPSIS FOR BACHELOR OF APPLIED SCIENCE IN INDUSTRIAL BIOTECHNOLOGY WITH HONOURS**

BSF2222

Laboratory Quality Management

Credit Hour: 2

Prerequisite: None

**Synopsis**

The purpose of this course is to introduce to you the comparable GLP and ISO 17025 Principles and Requirements for high-stakes testing and calibration laboratories. The course will address the quality infrastructure supporting testing and research laboratory management so one become familiar with many aspects of laboratory quality management and how to achieve recognition and certification. Upon successful completion of this course, students will have a firm grasp of the technical and philosophical aspects of laboratory quality management and will have the skills to initiate laboratory quality management for high-stakes testing and research programs.

**Course outcome**

By the end of semester, students should be able to:

CO1: Demonstrate understanding of 12 Essentials of Lab Quality Management System.

CO2: Communicate effectively of 12 Essentials of Lab Quality Management System.

CO3: Demonstrate awareness of the important of Lab Quality Management System to the institution, environment and community.

BSB2133

Cell and Molecular Biology

Credit Hour: 3

Prerequisite: None

**Synopsis**

This course discusses fundamental concepts of cell biology, structure and function of cellular organelles and their biomolecules. Emphasis will be given on compositions,

structures and functions of cell membrane and concepts of cell division. The course also includes discussions on applications of cell biology such as cancer, pathogen infections and stem cells. Concepts of molecular biology, gene expressions and its control are also discussed. Brief introductions on techniques of molecular biology such as DNA/RNA extraction, polymerase chain reaction (PCR), and gene cloning also explained in this course.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Describe the principle of cell and molecular biology.

CO2: Apply cell and molecular biology principle to solve related problems.

CO3: Analyse cell structures, biological mechanisms and their related investigation techniques.

CO4: Convey ideas clearly and effectively, as well as giving feedback on given topics.

BSB2472

Cell and Molecular Biology Laboratory

Credit Hour: 2

Prerequisite: None

**Synopsis**

In this course, students will be introduced and practice modern biotechnology laboratory techniques and theories. The topics that will be covered are proper laboratory equipment handling and techniques such as nucleic acid isolation and purification for Deoxyribonucleic Acid (DNA) cloning, polymerase chain reaction (PCR) and gel electrophoresis analysis. In addition, students will be exposed to basic tools for analysis of genes.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Relate the fundamental theories with laboratory experiments

CO2: Demonstrate skills in performing cell and molecular biology experiments

CO3: Demonstrate skills in handling cell and molecular biology-related equipment

CO4: Analyse, Interpret and relate

experimental data with the fundamental theories

CO5: Communicate through report writing

CO6: Work in team during laboratory sessions.

BSB1113

Biochemistry

Credit Hour: 3

Prerequisite: None

### Synopsis

The course is designed to study the physical and biochemical characteristics of biomolecules including nucleic acids, proteins, carbohydrates and lipids. Important pathways for biosynthesis and degradation of nucleic acids, proteins, carbohydrates and lipids will be discussed. Production of energy from carbohydrates and lipids and the related metabolisms will also be discussed. Besides that, the principle of cellular signalling in living organisms also will be described in this course.

### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the structure, properties and biochemical roles of the biomolecules

CO2: Illustrate the energy productions in cells by glucose and its intermediates.

CO3: Explain biomolecules biosynthesis and degradation in metabolism

CO4: Compare the functionality of various metabolic pathways and importance of their integrations in organisms

CO5: Present idea in verbal and written form effectively and provide feedback on the given topic

CO6: Demonstrate structure illustrations of various biochemical compounds

BSB2173

Bioanalytical Chemistry

Credit Hour: 3

Prerequisite: BSB1102, BSB1113 and BSB1402

### Synopsis

This course introduces spectroscopic

methods for matrix characterization, principles of electrophoresis, isoelectric focusing, capillary electrophoresis, centrifugation methods, chromatography and mass spectrometry of biomolecules.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain and interpret the principles of different bioanalytical methods for their appropriate application

CO2: Apply fundamental knowledge of analytical biochemistry for their applications

CO3: Compare and contrast the function of each analytical instrument with their potential application in research as well as industries

CO4: Work in group to solve biochemical calculation assignment related to analytical instrument

BSB1402

Biochemistry Laboratory

Credit Hour: 2

Prerequisite: None

### Synopsis

The course introduces students with the basic calculation and techniques that are commonly used in a biochemical lab. The principle of spectrophotometry and the application of spectrophotometry in biochemistry. Several quantitative and qualitative tests on important biomolecules such as Lowry assay, Bradford assay and DNS assay.

### Course Outcome

By the end of semester, students should be able to:

CO1: Relate the fundamental theories with laboratory experiments

CO2: Demonstrate skills in performing biochemistry experiments

CO3: Demonstrate skills in handling basic biochemistry-related equipment

CO4: Analyse, Interpret and relate experimental data with the fundamental theories

CO5: Communicate through report writing.

CO6: Work in team during laboratory session

**BSB2442**

Bioanalytical Chemistry Laboratory

Credit Hour: 2

Prerequisite: BSB1102, BSB1113 and BSB1402

**Synopsis**

This course introduces spectroscopic methods for matrix characterization, principles of electrophoresis, isoelectric focusing, capillary electrophoresis, centrifugation methods, chromatography and mass spectrometry of biomolecules.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Relate the fundamental theories with laboratory experiments

CO2: Demonstrate an array of biotechnology equipment efficiently with the knowledge of functionalities and calibration

CO3: Demonstrate skills in handling analytical instrument

CO4: Analyse, interpret and relate experimental data with the fundamental theories

CO5: Communicate through report writing

CO6: Work in team during laboratory sessions

**BSB1102**

Biophysical Chemistry

Credit Hour: 2

Prerequisite: None

**Synopsis**

The goal of this course is to emphasize the principle and biochemical calculation that are commonly used in biological studies including preparation of buffers and solutions, acids and bases chemistry, aqueous ionic equilibrium, bioenergetics and kinetics. All of the assignments in this course are carried out in groups to develop teamwork skills among the students. Besides that, this course emphasized on information managing skills and lifelong learning by gathering the information on biophysical chemistry application from various sources.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Describe the principle of physical chemistry in biological studies

CO2: Apply biochemical calculation for biological studies

CO3: Construct graph based on data calculated using specific formula

CO4: Work in a group to answer biochemical calculation tasks.

CO5: Summarize information related to biophysical chemistry applications from multiple sources

**BSB1112**

Industrial Biotechnology

Credit Hour: 2

Prerequisite: None

**Synopsis**

This multi-disciplinary course provides students with an introduction to policy, scope and research area in the industrial biotechnology sector in Malaysia and the global scenario. This subject focuses on interaction between scientific discovery, applications and challenge impact in biotechnology. There are four focus fields including industrial microbiology, agricultural, healthcare, biomaterial, enzyme and bioinformatics potential processes will be discussed. Students also will be exposed to important and related components in commercialization such as issues, biosafety, bioethics, regulations, intellectual rights, facilities and expertise needed in biotechnology industries.

**Course Outcome:**

By the end of semester, students should be able to:

CO1: Explain the important principles and applications of industrial biotechnology related fields

CO2: Relate biotechnology related products with their suitable applications

CO3: Discuss current issues related to industrial biotechnology

CO4: Be aware on biosafety, bioethics and important of IP for biotechnology related products



CO5: Identify commercialization potential of biotechnology related products

BSB2143

Enzyme Technology

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course provides the theory and knowledge relevant to the enzymology principles including fundamental properties of enzymes, enzyme catalytic mechanisms and enzyme kinetics. Techniques employed in enzyme purification and characterization are also emphasized in this course. Students will also be introduced to the theory as well as applications of enzyme technology in food, medical, and household industries. Finally, this course serves to provide an awareness of the current and possible future applications of enzyme technologies. This course also emphasizes on the development of attitude and capability of the students to work in a group and gather information on the related field for lifelong learning.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Distinguish the fundamentals of enzyme properties, nomenclatures, characteristics and mechanisms

CO2: Apply biochemical calculation for enzyme kinetics

CO3: Compare methods for production, purification, characterization and immobilization of enzymes

CO4: Discuss various application of enzymes that can benefit human life

CO5: Discover the current and future trends of applying enzyme technology for the commercialization purpose of biotechnological products.

CO6: Plot graphs based on kinetics data

BSB2452

Enzyme Technology Laboratory

Credit Hour: 2

Prerequisite: None

#### Synopsis

An introduction in theory, techniques and practical in modern enzyme technology laboratory. Emphasis will be given in concept and technique on basic laboratory and instrumentation handling, extraction and purification process, and polyacrylamide gel electrophoresis for enzyme/protein separation.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Relate the fundamental theories with laboratory experiments

CO2: Demonstrate skills in performing enzymology experiments

CO3: Demonstrate skills in handling enzymology-related equipment

CO4: Analyse, Interpret and relate experimental data with the fundamental theories

CO5: Communicate through report writing

CO6: Work in team during laboratory session

BSB2193

Industrial Microbiology

Credit Hour: 3

Prerequisite: BSB1173 and BSB1432

#### Synopsis

This course introduces various industrial applications of microorganisms in traditional fermentation process and advanced contemporary applications such as productions of biological materials and vaccines, biopharmaceutical, bio emulsifier, biopolymers, and biodegradation. Discussion includes biotechnology unit operation, bioprocess design, process modulation, kinetics and analysis. In addition, students will be introduced to work flow and operation of an industry through a site-visit to a related industry.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Understand and apply the basic concept of industrial microbiology.

CO2: Describe the flow of product development and discuss the various emerging areas that can benefit human life.

CO3: Apply the concept of primary and secondary metabolites pathways for the biosynthesis of microbial products.

CO4: Analyse the microbial production of food, beverage, biomass, fuel and Chemicals and health-care products.

BSB1133

Organic Chemistry

Credit Hour: 3

Prerequisite: None

#### Synopsis

In this course, we will be introduced to the basic fundamental principles of organic chemistry. Structure, properties and stereochemistry of organic molecules and basic organic reaction to prepare common functional groups will be studied.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Describe characteristics and physical properties of organic molecules

CO2: Classify chemical compounds based on their structures

CO3: Recognize the main functional groups in organic chemistry and predict their reactions

CO4: Analyse of organic structure backbones with their functional groups

CO5: Cooperate in group to complete the assigned tasks in a given time

BSB2462

Industrial Microbiology Laboratory

Credit Hour: 2

Prerequisite: BSB1173 and BSB1432

#### Synopsis

This course covers practical applications of microbes in industries. Emphasis will be given on techniques for screening of potential industrial microbes, identification of microorganisms, water and food analyses, fermentation processes and antibiotic tests.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Relate the fundamental theories with laboratory experiments.

CO2: Analyse, Interpret and relate experimental data with the fundamental theories.

CO3: Demonstrate written communication skill through report writing.

CO4: Work in team during laboratory sessions.

BSB1412

Organic Chemistry Laboratory

Credit Hour: 2

Prerequisite: None

#### Synopsis

This practical course comprises several laboratory experiments related to organic chemistry. In organic chemistry experiments, students are exposed to melting point determination and mixture melting points, extraction, distillation, isolation and crystallization.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Relate the fundamental theories with laboratory experiments

CO2: Demonstrate skills in performing organic chemistry experiments

CO3: Demonstrate skills in handling organic chemistry-related equipment

CO4: Analyse, Interpret and relate experimental data with the fundamental theories

CO5: Demonstrate written communication skill through laboratory writing

CO6: Work in team during laboratory session

BSB3163

Plant and Mammalian Cell Technology

Credit Hour: 3

Prerequisite: None

#### Synopsis

Topics will be discussed in this course includes concepts, techniques and applications of plant and mammalian cell culture; principle of totipotency; essential equipment of a tissue and cell culture facility; growth media preparation; methods for growing and store suspension and adhesion cultures; different cell type such as embryogenic culture, callus, independent cell, and stem cells; as well as benefits from clone reproduction in agriculture, livestock, medicine, and other related fields. Principle and benefit of cryo-preservation and germplasm collection also will be discussed further.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Describe the principle and techniques of plant and mammalian cell/tissue culture

CO2: Discuss plant and mammalian cells technology approaches to be used in related biological applications.

CO3: Compare the advantages, disadvantages and application of each techniques used in culturing plant and mammalian cell/tissues

CO4: Relate the current scenario/challenges in commercialization of cell/tissue culture products

#### BSB3492

Plant and Mammalian Cell Technology Laboratory

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course introduces techniques and skills required in both plant and animal cell/tissue culture laboratories. Aseptic techniques and sterilization are emphasized in this course. For plant cell and tissue culture practical, students are exposed to media preparation and several tissue culture techniques including callus induction, organogenesis, shoot and root induction, and acclimatization of tissue cultured plantlets. While in animal cell practical, students are exposed to the techniques of handling mammalian cells, preparation of primary cell culture, calculating viability of cells and also cell toxicity studies.

#### Course outcome

By the end of semester, students should be able to:

CO1: Relate the fundamental theories with laboratories experiments

CO2: Demonstrate skills in performing plant and animal cell/tissue culture practices

CO3: Analyse, interpret and relate experimental data with the fundamental theories

CO4: Demonstrate written communication skill through report writing

CO5: Work in team during laboratory section

#### BSB3113

Gene Technology

Credit Hour: 3

Prerequisite: BSB2133 and BSB2472

#### Synopsis:

Topics discussed include the advanced techniques in gene technology including application of polymerase chain reaction (PCR) and real-time PCR, recombinant technology, genomic and cDNA libraries, molecular markers, DNA hybridization, functional genomic and genetic engineering in plants and animals. This course emphasizes on the application of gene technology in agriculture, medical and forensic. Students are also trained to participate in group discussion and present on the application of gene technology and related ethical issues.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Describe the principle of advanced techniques in gene technology

CO2: Relate the application of advanced techniques in gene technology with their requirement in agriculture, medicine and forensics

CO3: Compare the principle and applications of gene technology techniques

CO4: Recommend suitable gene technology techniques for medicine, agriculture and forensics applications

CO5: Discuss related ethical issues on genetically modified organisms (GMOs)

BSB3312  
Final Year Project I  
Credit Hour: 2  
Prerequisite: None

Synopsis:

To expose and encourage student in doing research, define problems, give an opinion on how to overcome the problems and get related information regarding the problems. The topics that will discuss in this subject are literature review and methods that has been used by previous research, research report (proposal), research ethics and project management.

Course Outcome:

By the end of semester, students should be able to:

- CO1: Originate problem statement, objective, scope of the research and methodology based on literature review.
- CO2: Demonstrate good organization of laboratory logbook in recording experimental methods and data.
- CO3: Assemble research proposal in professional format such as oral presentation.
- CO4: Report satisfactory project progress within the timeline.

BSB3472  
Gene Technology Laboratory  
Credit Hour: 2  
Prerequisite: BSB2133 and BSB2472

Synopsis:

Students will be exposed to the techniques in gene technology such as total DNA/RNA extraction, gene detection and analysis using conventional PCR contrasting with analysis using real-time PCR. In addition, DNA molecular marker techniques will also be covered in this course. Students will also be exposed to the application of bioinformatics software for gene analysis and sequence confirmation. The mini project included in this course exposed students to the essential workflow of molecular and gene analysis studies.

Course Outcome:

By the end of semester, students should be able to:

- CO1: Relate the fundamental theories with laboratory experiments
- CO2: Demonstrate skills in performing gene technology experiments
- CO3: Demonstrate skills in handling gene technology-related equipment
- CO4: Analyse, Interpret and relate experimental data with the fundamental theories
- CO5: Communicate through report writing
- CO6: Manage experiment in laboratory following rules and regulations

BSB3123  
Bioprocess Technology  
Credit Hour: 3  
Prerequisite: None

Synopsis:

The course discusses the basic operational in bioprocess technology, unit, dimension, mass transfer at the equilibrium phase, stoichiometry of microbial growth and product formation. This course explicates the connection between microbial growth, product formation, mass transfer and environment. Likewise, this course gives an overview of the bioprocess from raw material to product. Upstream and downstream processing will be discussed. This course explains the processes and techniques used for extraction and purification of a product from culture medium. Also, bioprocess consideration in using animal and plant cell cultures will discuss using different techniques.

Course Outcome

By the end of semester, students should be able to:

- CO1: Describe the principle and applications of bioprocess technology.
- CO2: Apply fundamental calculation in bioprocessing.
- CO3: Compare and contrast the principle and application of different types of bioreactors for large scale production.
- CO4: Recommend suitable condition or bioprocessing flowsheet for different types of cells, tissues and organisms.
- CO5: Discuss the important aspects of bioprocess technology for commercialization

purpose of biotechnological products.  
CO6: Illustrate schematic diagram for upstream and downstream processing.

BSB3583  
Advanced Enzyme Technology  
Credit Hour: 3  
Prerequisite: None

#### Synopsis:

This course provides advanced knowledge and information on enzyme technology. It will emphasize on the production of enzyme, industrial enzymes and innovative application of some specialized enzyme. Techniques employed in enzymes engineering and hybridization are also emphasized in this course. Students will also be introduced to the theory as well as applications of enzyme technology in food, medical, and diagnostic industries. Finally, this course serves to provide an awareness of the social/ ethical issues related to possible future applications of enzyme technologies.

#### Course outcome:

By the end of semester, students should be able to:

- CO1: Explain the concept and applications of enzymes technology in biotechnology-related industries.
- CO2: Choose the best strategies to produce the enzymes suitable for biotechnology-related industries.
- CO3: Differentiate enzymes production and currently industrial enzymes that are used in biotechnology-related industries.
- CO4: Propose a strategy of industrial enzymes production suitable for industrial scale application.
- CO5: understand and be aware of commercial, ethical, legal and socio-cultural impacts on the advanced application of enzyme in food, medicine and industry.
- CO6: Illustrate the new application of enzymes as biosensor in a schematic diagram.

BSB3482  
Bioprocess Technology Laboratory  
Credit Hour: 2  
Prerequisite: None

#### Synopsis:

This laboratory course covers a few practical related to bioprocess in industries. It emphasizes on the basic techniques the determination of glucose and some experiments on the fermentation kinetics.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Relate the fundamental theories with laboratory experiments.
- CO2: Demonstrate skills in performing bioprocess experiments.
- CO3: Demonstrate skills in handling bioprocess-related equipment.
- CO4: Analyse, interpret and relate experimental data with the fundamental theories.
- CO5: Communicate through report writing.
- CO6: Manage experiments in laboratory following rules and regulations.

BPQ1223  
Principles of Operation Management  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

The course provides a range of academic knowledge, operations understanding, operational management techniques. It will focus on the main decision areas of operations management and the role of the operations manager for productivity improvement.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply the fundamental concept and the main areas of operation management.
- CO2: Demonstrate operation decisions in solving operational problems.
- CO3: Justify operations management requirements.

BSB4173  
Extraction and Bioseparation

Credit Hour: 3  
Prerequisite: None

### Synopsis

This course introduces the basic principle of extraction, separation and purification of bioproducts together with theory and principle of related separation instruments. In extraction, students will be exposed on extraction methods of nucleic acids, proteins and metabolic compounds. While in bioseparation, students will be exposed on separation and purification principles, techniques including separation by liquid chromatography, filtration, precipitation, sedimentation, crystallization and drying process.

### Course Outcome:

By the end of semester, students should be able to:

- CO1: Explain the principle of extraction and bioseparation of bioproducts
- CO2: Apply fundamental calculation in extraction and bioseparation
- CO3: Compare and contrast different bioseparation approaches of biological materials
- CO4: Recommend suitable extraction and bioseparation approaches for small- and large-scale production of biological materials
- CO5: Discuss the important aspects in extraction and bioseparation of biotechnological products for commercialization purpose

BSB4812  
Industrial Training  
Credit Hour: 12  
Prerequisite: All faculty and programme courses

### Synopsis

This course aims to give chances for the student to practice and apply their knowledge and skills that they gain during their study. During the placement, we expect students to keep a log book, in which they make a regular entry describing the work they are undertaking. Then, students need to provide industrial training report to describe their technical and personal development during

their placement. The industrial training report need to hand in to the university supervisor. Students need to do final presentation for assessment. Students are supervised by industrial and university supervisors to guide and ensure they can do their work as good as possible and achieve the objective for this course.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Adapt working culture in project, consultant, construction and related industry.
- CO2: Organize the industrial training knowledge, experience and skill in the preparation of the industrial training report.
- CO3: Build effective communication skills in written and oral presentation.

BSB4422  
Extraction and Bioseparation Laboratory  
Credit Hour: 2  
Prerequisite: None

### Synopsis

This course exposes students to the principle of extraction, separation and purification of bioproducts together with related separation instruments. Students will be exposed to the methods of extraction of nucleic acids, proteins and metabolic compounds. Students will also be exposed to various separation and purification techniques.

### Course outcome:

By the end of semester, students should be able to:

- CO1: Relate the fundamental theories with laboratory experiments.
- CO2: Demonstrate skills in extraction and separation procedure of bioproducts.
- CO3: Demonstrate skills in handling equipment related to extraction and bioseparation.
- CO4: Analyse, Interpret and relate experimental data with the fundamental theories.
- CO5: Communicate through report writing.
- CO6: Manage experiments in laboratory following rules and regulations.

BSB4324  
Final Year Project II  
Credit Hour: 4  
Prerequisite: None

#### Synopsis:

This course is intended as the second part of Final Year Project I (BSB3302). The students are required to conduct the research, collect and analyse data, discuss the findings and form the conclusions. At the end of the semester, each student is required to present their findings and submit a dissertation. Evaluation is based on oral presentation and submitted dissertation.

#### Course outcome:

By the end of semester, students should be able to:

- CO1: Analyse, interpret and relate experimental data with fundamental theories.
- CO2: Demonstrate good organization of laboratory logbook in recording experimental methods and data.
- CO3: Assemble research finding in professional format in the form of oral presentation. Assemble research finding in professional format in the form of oral presentation.
- CO4: Report satisfactory project progress within the timeline.

BSB3503  
Biomanufacturing  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course provides a brief description about process plant design and basic fundamental of Good Manufacturing Practice (GMP). It is important to know all processes in plant and distinguish between them. Nowadays, GMP is known as an essential backbone for compliance in good manufacturing practices. Therefore, students will learn how to design flow sheets in process plant and able to explain all processes that involved in manufacturing for example up streaming, scale up and down streaming process. Other than that, students will learn how to construct

a feedback and feedforward system in biomanufacturing. Students also will be introduced to aspects of GMP such as facilities related documentation as well as will be exposed to important and related components in commercialization such as issues, biosafety, regulations, facilities and expertise needed in biotechnology industries.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Describe diagrams, techniques, control systems, processes and regulatory procedures that are used in biomanufacturing industries.
- CO2: Illustrate proper GMP-compliance facilities, control systems, processes, hazard analysis and documentation that are applied in biomanufacturing industries.
- CO3: Compare and contrast different types of diagrams, techniques, control systems, processes and regulatory procedures that are used in biomanufacturing industries.
- CO4: Develop an environmental-friendly product using biomanufacturing technology that addresses challenges or concerns in biotechnology.
- CO5: Discuss related ethical, commercial and social issues of biomanufacturing technology including impact to human and environment.
- CO6: Demonstrate the use of environmental-friendly product of biotechnology with their suitable business and industrial applications.

BSB3593  
Biosensor Technology  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course discusses current concepts, terms and applications of biosensor technology. This course integrates knowledge from various fields such as genetic engineering, immune-techniques and protein engineering for the production of biosensor devices in multitude of applications such as medical, food analysis, clinical diagnostics and environmental monitoring. The course also focuses on the classification and the

principles of the various types of biosensors, various measurements involved, biological materials or bioreceptors, transducer descriptions, biosensor characteristics and their recent applications.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Classify the components of a biosensor and differentiate methods for immobilization that can be used for surface derivatization. Classify the components of a biosensor and differentiate methods for immobilization that can be used for surface derivatization.

CO2: Relate the application of biosensor in industry.

CO3: Compare and contrast the principle and applications of biosensors.

CO4: Design a hypothetical biosensor device which can be used in a related field based on the fundamental knowledge learned in biosensor technology.

CO5: Discuss related ethical issues in biosensor technology including rules and regulation as well as impact to human and environment.

CO6: Demonstrate the newly designed hypothetical biosensor in related applications

#### BSB3563

Bioremediation

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces various advanced applications of plants and microorganisms in evaluating whether bioremediation is a viable strategy for remediation of a contaminated site, factors that influence the rate and extent to which environmental contaminants are metabolized by microorganisms in the environment as well as bioremediation techniques for clean-up the mess according to bioremediation classifications as Biotransformation, Biodegradation and Mineralization. In addition, the student will be able to dealing with an effective innovative technology for treatment of a wide variety of contaminants. This technology includes phytoremediation (plants) and

rhizoremediation (plant and microbe interaction). Rhizoremediation, which is the most evolved process of bioremediation, involves the removal of specific contaminants from contaminated sites by mutual interaction of plant roots and suitable microbial flora.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Describe the fundamental principles and applications relating to bioremediation.

CO2: Relate the concept of bioremediation technology to real-life.

CO3: Compare and contrast various advantages, disadvantages and limitations approaches of bioremediation in a commercial setting.

CO4: Discuss the impact and interactions between contaminants, soil, water and its bioavailability for biodegradation.

#### BSB3543

Nutraceuticals and Functional Foods

Credit Hour: 3

Prerequisite: None

#### Synopsis

There is a global growing awareness on the contributions of nutraceutical and functional food that promotes health benefits. This course gives an overview of the bioactive compounds that are currently regarded as functional foods and nutraceuticals. The identification and related assessment methods of these bioactive compounds are discussed. This course includes new and innovative technologies for the processing of functional foods and nutraceuticals. These technologies are developed to address consumers' concerns on quality and safety issues. The safety guidelines and regulations in the development of nutraceutical and functional food are also highlighted in this course.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Explain the concept and applications of nutraceuticals and functional foods in biotechnology related industries.



CO2: Illustrate the process of large-scale production of nutraceuticals and functional food products for biotechnology related industries

CO3: Distinguish between nutraceuticals and functional food products those are currently used in biotechnology-related industries

CO4: Illustrate and propose the latest bioavailability and bioequivalence requirements to benefit human life

CO5: Understand and be aware of commercial, ethical, legal and socio-cultural impacts on the advanced application of nutraceuticals and functional foods in food, medicine and industry.

CO6: Illustrate the future trends of nutraceutical and functional food industries

### BSB3553

Bioinformatics

Credit Hour: 3

Prerequisite: None

#### Synopsis

Bioinformatics is the science of storing, extracting, organizing, analysing, interpreting, and utilizing biological information. Bioinformatics use biological information to solve biological problems. This course will deliver descriptions of this rapidly evolving field, and facilitate user access to and manipulation of the biological data. Topics will include an introduction to bioinformatics, biological databases and relevant tools available to retrieve and analyse the information within these. Descriptions of various techniques, such as evolutionary analysis, data mining, protein structure/function.

#### Course Outcome:

By the end of semester, students should be able to:

CO1: Explain the principle and theoretical basis of the bioinformatics tools.

CO2: Identify the bioinformatics tools for data analysis.

CO3: Compare the advantages and disadvantages of bioinformatics tools.

CO4: Recommend suitable approach to solve biological problems.

CO5: Aware on ethical, moral and professionalism in the usage of bioinformatics

tools.

CO6: Convey ideas verbally on bioinformatics related issue as well as giving feedback on giving topics.

### BSB3513

Immunotechnology

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course provides a comprehensive overview on basic immunology, which covers the innate immune responses and acquired immunity. Topics include specific interactions of target cells and T cells, generation and molecular structure of B and T cell antigen receptors, signalling through immune receptors, development of antigen specific T and B cells, and specific roles of cytokines /lymphokines. This course emphasizes T and B cell-mediated immunity and topics of clinical relevance, such as microbial immunity, allergy, autoimmunity, tumor immunology, transplantation immunology, and immunotherapy. In addition, generation and application of monoclonal antibodies will be discussed.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the concept of immune system

CO2: Explain the contemporary approaches to manipulate the immune system in term of transplantation and immunotherapy

CO3: Differentiate the structure of antibody, MHC and their roles in an immune system

### BSB3523

Bionanotechnology

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course will be focused on basic principle of nanotechnology such as fabrication and collection from building blocks. This topic also introduces biological devices including principle, operation and practical reality in

building and application. Other topics will be discussed includes biomolecules, nano fabrication, protein array technology, medical application of bionanotechnology, ethical and policy in bionanotechnology and the future prospect of bionanotechnology.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain principle of bionanotechnology

CO2: Describe synthesis of various nanoparticles

CO3: Describe current and future application of bionanotechnology

BSB3533

Biopharmaceuticals

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course provides student to introduction of biopharmaceuticals, application of biotechnology especially on transforming proteins and genes into therapeutics, innovation models in the biopharmaceutical sector, history of plant-made biopharmaceuticals and also risk analysis and safety of plant made biopharmaceuticals.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the application of biotechnology in therapeutics production

CO2: Describe the models used in biopharmaceutical sector

CO3: Explain about plant-made biopharmaceuticals, their risk and safety

BSB3573

Reactor Design

Credit Hour: 3

Prerequisite: None

#### Synopsis

The course will emphasize on the basic design of a fermenter which include the principle and concept of the process control

involved. This course introduces two basic concepts: (i) reaction mechanisms and kinetic rate expressions for homogeneous and heterogeneous reacting systems, including enzyme catalysed reactions and cell growth kinetics, and (ii) reactor design for the homogeneous reaction systems. The design principles for ideal homogeneous reactors are introduced, followed by the concept of RTD (residence time distribution) to diagnose and account for the non-idealities in flow patterns. For heterogeneous reactions, the role of transport (diffusion) effects, Thiele modulus, and catalyst effectiveness factor are introduced.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Analyse the kinetic parameters of different fermentation process and choose suitable bioreactor for the growth of organism and product formation at industrial scale

CO2: Recognise, compare and draw the schematic diagram for specific types of bioreactors

CO3: Describe process economic weakness of a fermentation process and indicates its logical for process optimization

CO4: Design a scale-up bioreactor on geometric similarities and level it to industrial approaches

## CURRICULUM STRUCTURE BACHELOR OF APPLIED SCIENCE IN INDUSTRIAL CHEMISTRY WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH		
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	
FACULTY & PROGRAMME COURSES	UHL2422 English For Technical Communication	UHC1012 Falsafah Dan Isu Semasa	UHL2412 English For Academic Communication	UHL2432 English For Professional Communication	UHF2**1 Foreign Language II	BSK3143 Unit Operation	BSK4153 Advanced Instrumentatio n Technique	BSK4812 Industrial Training	
	BCS1023 Programming Techniques	UQB1**1 Co-Curriculum I	UHS1011 Softskill I	UGE2002 Techno- Preneurship	UHL4012 Elective Social Sciences	BSK3472 Unit Operation Laboratory	BSK4314 Final Year Project II		
	BSK1103 Organic Chemistry	BSK1143 Inorganic Chemistry	UHF1**1 Foreign Language I	UQ*2**1 Co-Curriculum II	UHS2011 Softskill II	BSK3153 Organic Chemistry Process	BSK3**3 Elective IV		
	BSK1402 Organic Chemistry Laboratory	BSK1422 Inorganic Chemistry Laboratory	BSK2143 Instrumentation Method	UHC2022 Penghayatan Etika Dan Peradaban	BSK3103 Organic Spectroscopy	BSK3302 Final Year Project I	BSK3**3 Elective V		
	BSK1133 Physical Chemistry	BSK1153 Analytical Chemistry	BSK2442 Instrumentation Method Laboratory	BSK2133 Separation Technique	BSK3462 Organic Spectroscopy Laboratory	BSK3**3 Elective II			
	BSK1412 Physical Chemistry Laboratory	BSK1432 Analytical Chemistry Laboratory	BSK2183 Thermo Dynamics	BSK2123 Material Chemistry	BSK3163 Inorganic Chemistry Process	BSK3**3 Elective III			
	BUM2123 Applied Calculus	BUM2413 Applied Statistics	BSF2112 Industry Quality Management	BSK2452 Material Chemistry Laboratory	BSK3**3 Elective I				
		BSF1222 Industry Safety Management	BPO1223 Principles of Operation Management	BSK2223 Laboratory Quality Management & Validation					
	TOTAL CREDIT	18	18	18	17	15	16	13	12
	TOTAL CREDIT FOR GRADUATION	127							

**ELECTIVE COURSES FOR  
BACHELOR OF APPLIED SCIENCE IN INDUSTRIAL CHEMISTRY WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BSK3513	Petrochemistry	3
2	BSK3523	Oleochemistry	3
3	BSK3533	Polymer chemistry	3
4	BSK3573	Flavor and fragrance chemistry	3
5	BSK3583	Electrochemistry	3
6	BSK3593	Environmental chemistry	3
7	BSK3503	Functional food	3
8	BSK3633	Medicinal chemistry	3
Total minimum credits of elective courses for graduation *Students are compulsory to take FIVE (5) elective courses during the study			15

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Possess competency in industrial chemistry and innovative applications
PEO2	Possess high level of professionalism, responsive towards commercial and social issues
PEO3	Competent in analysis, research and development global trend in science, technology and innovations

**PROGRAMME OUTCOMES (PO)**

PO1	Possess knowledge and understanding of chemical sciences.
PO2	Ability to design, conduct experiments as well as to analyze and interpret data in relation to laboratory and research works.
PO3	Possess problem solving skills thru creative and innovative solutions.
PO4	Ability to communicate effectively in verbal and written forms.
PO5	Ability to work responsibly as a team.
PO6	Ability to undertake life-long learning and strive for continuous knowledge and professional development.
PO7	Possess business acumen and entrepreneurship.
PO8	Possess professional and ethical responsibility, and their obligation to the society.
PO9	Possess effective leadership quality with good interpersonal skills.

**COURSE SYNOPSIS****COURSE SYNOPSIS FOR BACHELOR OF APPLIED SCIENCE IN INDUSTRIAL CHEMISTRY WITH HONOURS**

BSK1153  
Analytical Chemistry  
Credit Hour: 3  
Prerequisite: None

**Synopsis**

This course will provide students with a basic understanding of analytical chemistry and major aspects of quantitative chemical analysis. The course is an introductory part of a series of analytical chemistry courses for industrial chemistry program. It will concentrate upon descriptive analytical chemistry and analytical methods based on chemical equilibrium which include precipitation and volumetric analysis.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Describe the theory and basic technique in analytical chemistry.
- CO2: Solve problems involving both the qualitative and quantitative analysis.
- CO3: Apply the essential facts, concepts, principles and theories relating to analytical chemistry to solve the real chemical analysis problems.

BSK1432  
Analytical Chemistry Laboratory  
Credit Hour: 2  
Prerequisite: None

**Synopsis**

The objective of this course is to provide students with the basic skills in analytical chemistry field, the science of chemical characterization and measurement. The course is an introductory part of a series of analytical chemistry courses for industrial chemistry majors. It will concentrate upon descriptive analytical chemistry and analytical methods based on chemical equilibria

which include precipitation, volumetric and thermal analysis. A brief introduction to instrumental methods, separation methods, instrument calibrations and method validations, process analytical chemistry as well as good laboratory practice will also be practiced in lab.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Explain the relationship of the chemical and physical properties of a system to the analytical process undergone.
- CO2: Demonstrate the several chemical monitoring using several analytical methods and evaluate the obtained data with group member.
- CO3: Express the optimal analytical chemical method in terms of the application or analyte to group member.

BSK1103  
Organic Chemistry  
Credit Hour: 3  
Prerequisite: None

**Synopsis**

This course discusses the fundamental theory of properties, synthesis and organic reactions where use the functional group as framework. Focus on the key concepts of organic chemistry through a study of the reactions of selected functional groups. A particular emphasis is placed on the underlying some mechanistic pathways that are involved. The stereochemistry of the molecular structure is also considered. The development of key skills is facilitated by a program of consultancy and practical.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Describe the chemical structures, properties of common organic compounds and their reaction.
- CO2: Explain the fundamental organic reactions, mechanism and reaction conditions.

CO3: Apply the fundamental organic chemistry in various industrial application.

BSK1402  
Organic Chemistry Laboratory  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

The practical course comprises several laboratory experiments related to organic chemistry. In organic chemistry experiments, students are exposed to melting point determination, extraction, distillation, isolation, crystallization, determination of optical activity and identification of an organic functional groups.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply the knowledge of organic chemistry to solve the problem.  
CO2: Report and discuss the data and information of the experiment.  
CO3: Communication by explain questions given based on experiments.

BSK1143  
Inorganic Chemistry  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

The objective of this course is to give the student a basic understanding of theoretical inorganic chemistry and to apply this understanding to problem solving involving critical thinking. The topics covered in this course include periodic trends, foundations of bonding theory, basic coordination chemistry, chemistry of the main group elements and block d elements. Some of the important concepts in bioinorganic chemistry as well as nanomaterials, nanoscience and nanotechnology will be discussed. This basic understanding is to prepare the student for additional coursework, either in chemistry or in other disciplines, and to help the student

function in a technological society.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain certain key introductory concepts in inorganic chemistry (e.g. crystal field theory, common structural types, bonding) as well as the physical and chemical properties of inorganic compounds.  
CO2: Use these concepts in problem solving, describe the chemistry of main group elements and transition metals.  
CO3: Use resources to follow the current interests in inorganic chemistry.

BSK1422  
Inorganic Chemistry Laboratory  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This course will provide the students a clear idea of the reactivity of the elements in different groups.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain the chemical reactions of the main group elements.  
CO2: Ability to design, conduct experiments as well as to analyse and interpret data in relation to laboratory works.  
CO3: Use resources to explain the chemical reactions.

BSK1133  
Physical Chemistry  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

The course discusses the concepts and fundamental principles of physical chemistry. These include the properties of solid, liquid and gas, chemical equilibrium, dissolution and solution properties, chemical colloid and

surface, thermodynamics, chemical kinetics and catalyst. In order to achieve technical development in the advanced technologies that requires the ultimate precision of atomic level, it is indispensable to understand the physical phenomena involved in the Industrial technology on the basis of fundamental principles.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Define the various laws in terms of chemical reactions.

CO2: Analyse/solve the given problem from physical chemistry.

CO3: Applications the important physical laws in industrial processes.

BSK1412

Physical Chemistry Laboratory

Credit Hour: 2

Prerequisite: None

#### Synopsis

Practical comprises laboratory experiments involving theory in the physical chemistry course. Students will be exposed to chemical equilibrium, thermochemistry, calorimetry, electrochemistry and kinetic theory of gases and various experiments related to physical chemistry concepts.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Understanding the theory of physical chemistry.

CO2: Ability to conduct experiments, analyse and interpret data from laboratory works.

CO3: Problem solving skills thru laboratory experimental data.

BSK2143

Instrumentation Method

Credit Hour: 3

Prerequisite: BSK1133

#### Synopsis

This course is designed to introduce the modern instrumental methods that are used to solve analytical problems in chemistry. Qualitative and quantitative analysis which were studied in Analytical Chemistry course will be further explored. The course will begin with the explanation on instrumentation method concepts and the tools for quantitative analysis. Students will be introduced to spectroscopy (AAS, HPLC, GC, IC, MS, UV/VIS, FTIR, and NMR) and will deal with the methods of electroanalytical chemistry.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Demonstrate the knowledge of instrumental analysis principles.

CO2: Select the most appropriate instrumental analysis technique to solve an analytical problem.

CO3: Able to discuss new application in instrumental analysis technique relevant to the fast progressing of chemical analysis area.

BSK2442

Instrumentation Method Laboratory

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course exposes students to modern instrumental methods including UV-visible spectrophotometers (UV/VIS), Atomic Absorption Spectrometer (AAS), High performance Liquid chromatography (HPLC), and Gas Liquid Chromatography (GC) with various detectors that are used to solve analytical problems in chemistry. Students will develop skills like being a team player through working in groups and technical writing skills through report writing.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Show appropriate experimental technique in instrumentation laboratory.

CO2: Understanding the principles in instrumentation laboratory.

CO3: Write scientific report with relevant reference materials.

BSK2123

Material Chemistry

Credit Hour: 3

Prerequisite: None

### Synopsis

This course introduces students to the science of materials, including the scopes of physics, chemistry and basic engineering which complement the so-called interdisciplinary area of materials science. Emphasis is given on three main elements: Structures, Properties and Performances, with an additional material's applications. Atomic/sub-atomic structures, bonding, crystal structure and defects will be described. Properties (electrical, mechanical, optical) and Performances (processes and deformation) will be included. The uses of selected materials will also be considered.

### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental knowledge of each material that covers in this course.

CO2: Apply calculation related to mechanical, electrical, magnetic, thermal and optical properties of materials and their composites.

CO3: Correlate the material chemistry logic and knowledge to industrial landscape.

CO4: Recognize the needs for, and possess the capability in life-long learning.

BSK2452

Material Chemistry Laboratory

Credit Hour: 2

Prerequisite: None

### Synopsis

This course exposes students to the handling of various materials and their laboratory preparations and characterizations. The

students will learn the skills and experimental techniques for the synthesis. The determination of their properties and characterizations of some important materials will be discussed in the Material Chemistry course.

### Course Outcome

By the end of semester, students should be able to:

CO1: Practice the procedures in handling of industrial materials and the role of materials scientist in the future development of industry.

CO2: Analyse the mechanical, electrical, magnetic, thermal and optical properties of materials and their composite as well as the influence of fillers on these properties.

CO3: Acquire a working knowledge on the relationship between the raw material properties and the processing.

CO4: Perform creativeness ideas as well as teamwork and communication skills.

BSK2183

Thermodynamics

Credit Hour: 3

Prerequisite: BSK1113

### Synopsis

This course discusses thermodynamic in greater detail. Changes in physical properties will be extensively discussed in each law of thermodynamics. A special emphasis will be placed on the basic concepts of work, heat, internal energy, heat capacity and enthalpy changes in First Law of Thermodynamic. In the Second Law, entropy changes in reversible and irreversible processes will be discussed. Absolute entropy will be discussed in Third Law. Also discussed in this course is thermal equilibrium in the Zeroth Law, principles and applications of ionic interactions and electrochemical systems.

### Course Outcome

By the end of semester, students should be able to:

CO1: Elaborate on thermodynamic concept.

CO2: Use thermodynamic concepts to explain chemical phenomena.



CO3: Calculate thermodynamic variables.

BSK2133

Separation Technique

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the basic principles and instrumentation of separation methods in chemistry. The major separation method used in chemical analysis, including chromatography and electrophoresis, will be discussed. Characterization, mechanism involved in separation, instrumental systems, advantages and limitation of methods will also be discussed. Students will be exposed to development and application of knowledge in explaining the concepts and principles of separation.

Course Outcome

By the end of semester, students should be able to:

CO1: Explain the relationship of the chemical and physical properties of a system to the separation process undergone.

CO2: Planning the separation method by using several separation mechanisms.

CO3: Adopt the optimal separation method for the application or targets.

BSK2223

Laboratory Quality Management and Validation

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the Good Laboratory Practice (GLP) and ISO 17025 Principles and Requirements for high-stakes testing and calibration laboratories. The quality infrastructure supporting testing and research laboratory management will be introduced with many aspects of laboratory quality management and the way to achieve recognition and certification. In addition, different perspectives and theories of method

validation including issues in validating, testing, research method and measurement of uncertainty will be addressed.

Course Outcome

By the end of semester, students should be able to:

CO1: Explain the GLP Principles and the ISO 17025 requirements to Laboratory Quality Management and certification.

CO2: Solve the theoretical problems on method validation and uncertainty comprehensively.

CO3: Demonstrate teamwork skills in assigned task.

BSK3143

Unit Operation

Credit Hour: 3

Prerequisite: BSK2183

Synopsis

This course discusses material balance on steady and recycle states and material balance based on chemical processes. Emphasis will be placed on energy balance concept based on chemical processes including calculation of heats of reactions and application of the steam table. Also covered in this course are fluid pressure and fluid dynamics, liquid flow measurement, heat transfer and heat exchangers.

Course Outcome

By the end of semester, students should be able to:

CO1: Apply the equation in solving problems of energy balance, materials balance, fluid mechanics and heat transfer.

CO2: Respond to a given problem based on unit operation.

CO3: Propose the concept of energy balance, material balance, fluid mechanics and heat transfer to overcome chemical processes problems.

BSK3472

Unit Operation Laboratory

Credit Hour: 2

Prerequisite: None

### Synopsis

Laboratory experiments are designed and structured for the course is related to several unit operations in an open laboratory concept. Laboratory practice are based on pilot-scale apparatus i.e. tray drier, mixers, fixed and fluidised unit, batch and continuous distillation column unit, liquid-liquid extraction unit etc.

### Course Outcome

By the end of semester, students should be able to:

CO1: Apply theory in project scale-up of bench-scale laboratory into pilot scale environment.

CO2: Follow good laboratory skill in an open laboratory concept and relate into several industrial processes.

CO3: Display effective communication in written (lab reports) with compile experimentally generated data into concise, clearly written laboratory reports, present the reports within the timeline.

CO4: Work as a team member to finish the given task.

CO5: Build a company which produce the product by applying unit operation knowledge.

### BSK3163

Inorganic Chemistry Process

Credit Hour: 3

Prerequisite: None

### Synopsis

This course gives an overview of modern inorganic chemical processes in the framework of global, sustainable and technical innovation involving major inorganic chemistry industries, traditional and novel inorganic processes, new chemical science and engineering technology, process design and development, manufacturing and operation, the future of inorganic chemical processes and the R&D activities for new inorganic processes.

### Course Outcome

By the end of semester, students should be able to:

CO1: Discuss confidently the technology progress and related development related in inorganic chemistry processes.

CO2: Develop skills of innovative practices in industrial inorganic processes.

CO3: Seek information on the state of art and express innovative suggestions for betterment of inorganic processes.

### BSK3153

Organic Chemistry Process

Credit Hour: 3

Prerequisite: None

### Synopsis

This course reviews the whole spectrum of today's most commonly used industrial organic chemicals. It explains their origins, uses, preparations. It answers questions of today of chemical industry, such as, what are the industrial chemicals and where do they come from? How are they made? What are the factors that affect their level of production and pricing? The course covers the sources, their competitive process and commercial uses of main building blocks starting from 1 carbon structure to other cycle building blocks as well as other important industrial products such as organic pigments, oils and fats, soap & detergents etc.

### Course Outcome

By the end of semester, students should be able to:

CO1: Elaborate the basic concept of the industrial organic chemical process, their chemistry and basic chemicals reactions their sources used in the production of large-scale industrial chemicals products.

CO2: Explain the synthesis and applications of various industrial chemicals products and their commercial importance.

CO3: Communicate the knowledge, their benefits, daily life use of industrial chemicals compounds effectively.

CO4: Identify and select appropriate problems and work independently in the chemical industry.

BSK3103  
Organic Spectroscopy  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course deals with the four major instrumental methods such as ultra-violet/visible, infrared, mass spectroscopy and nuclear magnetic resonance spectroscopy. It provides a concise introduction to the physical background of each, describing how molecules interact with electromagnetic radiation or how they fragment when excited sufficiently, and how this information may be applied to the determination of chemical structures of organic compounds. It also includes simple descriptions of instrumentation and emphasizes modern methodologies such as the Fourier transform approach to data analysis. Each chapter is related with a set of problems to be solved in the tutorial lectures to test the understanding of organic spectroscopy.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Point out detail the concepts, theories and application of spectroscopy in organic chemistry.  
CO2: Utilize the concepts and understanding of spectroscopy in organic structure determination and for quantitative purposes.  
CO3: Communicate effectively in written and oral form through group discussion and presentation session.  
CO4: Build up a strong knowledge in qualitative analysis in relations with various type of spectrum.

BSK3462  
Organic Spectroscopy Laboratory  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

The aim of this course is to provide students

with a basic understanding of spectroscopic analysis suitable for the determination of the structure of organic molecules. The course will concentrate upon the most commonly used techniques in organic structure determination, i.e. infrared spectroscopy (IR), ultraviolet-visible (UV-Vis) spectroscopy and gas-chromatography-mass spectrometry (GC/MS). The amount of time devoted to each technique in this course is meant to be representative of their current usage for structure determination.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain the basic concept of spectroscopic analysis in determining the chemical structure of organic molecules.  
CO2: Show the appropriate analytical method in conducting the respective experiments and interpret the spectral data acquired.  
CO3: Explain the principles of spectroscopy and determine the chemical structure using spectrum.

BSK4153  
Advance Instrumentation Techniques  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course is designed to produce graduates who have knowledge of advanced instrumentation involved in chemical-related industries and sectors (i.e. oil and gas, material, bio-related, commercial testing laboratory, environment). Topics discussed in this course cover physical and chemical testing, surface analysis, trace element analysis, thermal analysis and molecular testing. Students will learn the theory of the selected advanced instrumentation techniques, their operation and apply them into different chemical-related applications. Upon completion, students should be able to interpret and analyse the data obtained from each instrument.

#### Course Outcome

By the end of semester, students should be able to:

CO1: To explain the theory of advanced instruments used in chemical-related industries and sectors.

CO2: To relate the advanced instruments to the applications in chemical-related industries and sectors.

CO3: To interpret the results from various advanced instrumentation techniques.

#### BSK3302

Final Year Project I

Credit Hour: 2

Prerequisite: None

#### Synopsis

To expose and encourage student in doing research, define problems, give an opinion on how to overcome the problems and get related information regarding the problems. The topics that will discuss in this subject are literature review and methods that has been used by previous research, research report (proposal), research ethics and project management.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve related problems in a project topic using the appropriate principles.

CO2: Analyse the appropriate concepts learned and suitable solutions to be applied.

CO3: Defend ideas effectively in both oral and written forms

CO4: Initiate and commit to participate in gaining and sharing knowledge.

#### BSK4314

Final Year Project II

Credit Hour: 4

Prerequisite: None

#### Synopsis

The students are required to conduct the research, collect and analyse data, discuss the findings and form the conclusions. At the end of the semester, each student is required

to present their findings and submit a dissertation. Evaluation is based on oral presentation and submitted dissertation.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Analyse, interpret and relate experimental data with fundamental theories.

CO2: Demonstrate good organization of laboratory logbook in recording experimental methods and data.

CO3: Assemble research proposal in professional format such as oral presentation.

CO4: Report satisfactory project progress within the timeline.

#### BSK4812

Industrial Training

Credit Hour: 12

Prerequisite: All faculty and programme courses

#### Synopsis

This course aims to give chances for the student to practice and apply their knowledge and skills that they gain during their study. During the placement, we expect students to keep a log book, in which they make a regular entry describing the work they are undertaking. Then, student need to provide industrial training report to describe their technical and personal development during their placement. The industrial training report need to be submitted to the university supervisor. Student need to perform final presentation for assessment. Students are supervised by industrial and university supervisors to guide and ensure they can perform their work as good as possible and achieve the objective for this course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Adapt working culture in project, consultant, construction and related industry.

CO2: Organize the industrial training knowledge, experience and skill in the preparation of the industrial training report.

CO3: Build effective communication skills in written and oral presentation.

BSF1222  
Industry Safety Management  
Credit Hour: 2  
Prerequisite: None

#### Synopsis

This course exposes students to basic concepts in industrial and laboratory safety. Topics include quality systems (Good laboratory Practice and ISO/IEC 17025) for laboratory management, occupational health & safety and acts and related regulations. Students will be introduced to laboratory and industrial safety, laboratory and industrial accident, safety policy and procedure, emergency response plan, introduction to basic toxicology and first aid.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain the basic concepts of industrial and laboratory safety.

CO2: Apply the information of quality systems and safety policies, procedures and laboratory safety manual based on a task given.

CO3: Relate hazard communication and emergency preparedness and response.

CO4: Report the laboratory and industry functions to comply with safety rules and regulations, write a laboratory safety manual and work in a team for a task given.

BPQ1223  
Principles of Operation Management  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

The course provides a range of academic knowledge, operations understanding, operational management techniques. It will focus on the main decision areas of operations management and the role of the operations manager for productivity

improvement.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Apply the fundamental concept and the main areas of operation management.

CO2: Demonstrate operation decisions in solving operational problems.

CO3: Justify operation management requirements.

BSC1023  
Programming Technique  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course discusses on understanding problems and translating them into computer solution techniques using programming language. This course enables students to apply programming techniques, write programming codes from given problems and execute programming codes successfully.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Demonstrate various techniques in solving a problem.

CO2: Construct and run programs.

CO3: Differentiate various techniques in solving a problem.

BUM2123  
Applied Calculus  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

Calculus is widely used in solving problems in science and engineering applications. Students are exposed limits and continuity; the derivative; the derivative in graphing and applications; integration; applications of the definite integrals in geometry, science and engineering; exponential, logarithmic, and

inverse trigonometric functions; principle of integral evaluation; interpolation, extrapolation, errors.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Analyse and apply appropriate calculus concepts to solve various science and engineering problems.

CO2: Use appropriate software and tool to solve the graphical and computational problems in calculus.

CO3: Analyse and think critically a wide range of problem and solve it using ideas and methods in calculus.

CO4: Relate and applied the concepts and methods studied into other courses.

#### BUM2413

Applied Statistics

Credit Hour: 3

Prerequisite: None

#### Synopsis

Students are introduced to statistics including statistical problem-solving methodology and descriptive statistics, probability distribution commonly used, sampling distribution and confidence interval, hypothesis testing, analysis of variance (ANOVA), goodness of fit and contingency tables and regression and correlation including simple and multiple linear regressions. Appropriate software is used by students to implement some of these ideas in practice.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Analyse data using statistical theory and methodology, and recommend a conclusion or suggestion based on the analysed data.

CO2: Perform statistical data analysis by using appropriate software and scientific calculator.

CO3: Apply statistical concepts and methods learned to solve any related problems in various disciplines.

#### BSP2112

Industrial Quality Management

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course focuses on the management of quality for manufacturing and service sectors to achieve global competitiveness. Emphasis is placed on new techniques for managing quality. This course is divided into two parts. Part one introduces quality assurance principles, including (i) Good Manufacturing Practices (GMP), (ii) ISO 9000 family and (iii) various continuous improvement techniques and (iv) audit process. Part two focuses on the quality control system, which is concerned with (i) quality control tools used in industries, (ii) acceptance sampling, (iii) statistical data analysis, (iv) reliability and maintainability, and (v) cost of quality.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain the concept of industrial quality management which comply with Good Manufacturing Practice and other related regulations.

CO2: Apply philosophies of quality in an industrial management system.

CO3: Demonstrate leadership characteristic in assigned task.

#### BSK3593

Environmental Chemistry

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces the concepts of environmental science, environmental analysis, and environmental issues. It covers some fundamental aspects of the science of atmosphere, waters, and soil. This course covers environment quality guidelines used in Malaysia. It also covers the environmental monitoring strategies and analysis of

inorganic and organic analyte in environment.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Construct well-reasoned solutions to environmental predicaments, testing them against relevant criteria and standards.

CO2: Classify and explain the complex physical, chemical and biochemical systems of natural environments and different types of environmental monitoring strategies.

CO3: Show the ability to communicate effectively through group assignment or presentation.

CO4: Read appropriate reference materials regarding environmental issues to solve the problem.

#### BSK3573

Flavour and Fragrance Chemistry

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course is an introduction to aroma chemicals, essential oils, fragrances and flavour compositions for the food, cosmetics and pharmaceutical industry. The present state-of-the-art technology, the future use of resources and approaches for the production of the respective chemical compounds will be discussed. Another section is devoted to the description of the renewable resources of flavours: spice plants, fruits from moderate to tropical climates, vegetables, fermented and heated plants. Analytical methods, such as gas chromatography coupled to human or electronic noses or to a mass spectrometer, will be outlined. Consumer trends, legal and safety aspects will also be discussed. Novel renewable resources are sourced from biotechnology; enzymes, for example, bio-transform cheap substrates to produce flavours de novo.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain fundamental process

formation and formulation fragrance from plants.

CO2: Propose extraction, analysis and application of fragrance based on essential oil.

CO3: Seek information on the contemporary fragrance industries and technology independently.

#### BSK3633

Medicinal Chemistry

Credit Hour: 3

Prerequisite: None

#### Synopsis

The medicinal chemistry course discusses the introduction of medical plants, their role in drugs discovery. This course describes the Extraction of lead compounds, their chemistry, isolation and purification of novel drugs. This course focusing on the key concepts of drugs and their synthesis application human health. Med. Chem. course targeting the chemistry of drugs and their metabolism, and how a drug can act in human body. These contents of course have potential understanding about enzymes inhibitions and mechanism in drugs synthesis and application. This course also focusing on the key concepts of Structure Activity Relationship of drugs and affects and importance. Finally, the course will help to the students can work pharmaceutical industry. This course comprises about Nucleic acid, DNA and RNA and medicinally importance in genetic and role in mutation.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain the medicinal plants, drugs discovery, extraction of lead bioactive compounds, to understand their chemistry and isolation and purification novel drugs.

CO2: Formulate the drugs, synthesis, their mechanism of action, enzymes inhibitions and mechanism in drugs application antibiotics, antibacterial drugs effects on cell wall inhibition.

CO3: Apply the knowledge of medicinal chemistry into pharmaceutical industry, Structure Activity Relationship of various drugs. The role of importance of nucleoside

and nucleotides, the role RNA and DNA in cell.

BSK3513  
Petrochemistry  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course gives an overview on related processes and issues involved in petroleum and petrochemical industry. The first part of the course will introduce the concept of petroleum refining including the main processes such as distillation, reforming, cracking, coking and blending. The parameters affecting each process will be discussed. The characterization and analysis of various petroleum feedstocks and products using basic and advanced instruments will be introduced in this course. The second part of the course will cover the downstream processes to produce fine chemicals and other petro-based products from different feedstocks i.e. C1 to C4 alkanes, olefins and aromatic hydrocarbons. Besides, this course will also introduce alternative hydrocarbon feedstocks other than petroleum including bio-based feedstock. Lastly, some of the environmental aspects and pollution prevention in petroleum refining and petrochemical industry will be discussed.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the different parts in petroleum refining, petrochemical and other hydrocarbons related processes as well as the factors affecting the overall process and its safety aspects.

CO2: Analyse the relationship between the properties of feedstocks and products in chemical transformations of petroleum and other hydrocarbons including their reaction pathways.

CO3: Propose suitable method and/or instrument for analysing and testing any petroleum and petrochemicals related samples.

CO4: Seek information on the contemporary processes/methods in petroleum and

petrochemical industries independently.

BSK3533  
Polymer Chemistry  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

The course highlights the fundamental principles of polymer chemistry and technology. The discussion covers the reaction mechanism and types of polymers based on reaction category. The general characteristics of polymer, polymerization process, polymer synthesis, specific characteristics of polymer including thermal, morphological and rheological properties. The progress / development of industrial polymers using advanced technologies. The role played by polymer in the universe, earth, living system and human society is realized and a better understanding of polymeric materials in daily life.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain the fundamental principle of polymerisation reactions in terms of various reaction categories.

CO2: Analysing the rheological properties of advanced polymeric materials to improve the applications demanded in market.

CO3: Build up awareness on polymers and plastic materials useful in daily life.

BSK3583  
Electrochemistry  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course gives an overview of electrode processes, showing the way in which the fundamental components of the subject come together in an electrochemical experiment. There are individual discussions of thermodynamics and potential, electron-transfer kinetics and mass transfer in



electrochemical system. Concept from these basic areas are integrated together in treatments of various methods. The interfacial structure, adsorption and modified electrode will also be discussed. By mastering the fundamental in electrochemical processes, their applications in various aspects will be discussed.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain fundamental electrode processes in terms of thermodynamics and kinetics.

CO2: Propose electrochemical methods to solve industrial-based problem.

CO3: Seek information on the contemporary electrochemical method independently.

BSK3503

Functional Food

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course focuses on the usage and application of plant and animal-based food products with their important functional properties and health benefits. Students will learn about constituents that make the food product functional and they will learn about chemistry and physiological effects of functional food.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Identify the chemical constituents in functional food that affects the health benefits.

CO2: Describe the structure and function of chemical constituents in the functional foods.

CO3: Select functional food products and describe their health benefits with other group members for market.

BSK3523

Oleochemistry

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course covers various aspects of oils and fats, including oleochemical derivatives. Oleochemical compounds are environmentally friendly chemicals that can be produced from raw material of oils and fats from plant, animal and petroleum by cracking process, or modification. In recent times, depleting sources from fossil origin, oils and fats of non-fossil origin have started to make great re-entries into various industries including the fuel sector. The advantage of such oils and fats is that their sources are renewable. Research in the field of oleochemistry has been progress rapidly in Malaysia. This allows our country to continue to emerge as a developed country that is competitive and continues to lead the global oleochemical industry. In this course, recent trends in research and development of oleochemistry will be discussed.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Understand the general concept of oleochemistry (lipids, triacylglycerols, fatty acids etc.)

CO2: Studied the oleochemical feedstocks, production, analyses, biocatalyst, structures and applications.

CO3: Appreciating the application of oleo chemistry

## CURRICULUM STRUCTURE BACHELOR OF APPLIED SCIENCE IN MATERIAL TECHNOLOGY WITH HONOURS

YEAR SEM	FIRST		SECOND		THIRD		FOURTH		
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	
FACULTY & PROGRAMME COURSES	BSP1153 Mechanics & Thermodynamics	BSP1133 Organic Chemistry	BSP2153 Material Science & Technology	BSP2163 Colloid & Surface Science	BSP3112 Ceramics	BSP3183 Failure Analysis	BSP4172 Material Selection & Processing	BSP4812 Industrial Training	
	BSP1163 Electricity, Magnetism & Optics	BSP1173 Inorganic Chemistry	BSP2123 Material Characterization	BSP2193 Rheology	BSP3153 Polymers	BSP3173 Corrosion	BSP*5*3 Elective III		
	BSP1422 Physics Laboratory	BSP1432 Chemistry Laboratory	BSP2422 Material Science & Solid-State Lab	BSP2432 Rheology & Colloid Lab	BSP3462 Polymer & Composite Laboratory	BSP3452 Advanced Material Laboratory	BSP*5*3 Elective IV		
	UHC 1012 Falsafah Dan Isu Semasa	BSP1113 Physical Chemistry	BSP2113 Solid State Physics	BSP2133 Metals & Alloys	BSP3472 Metal & Ceramic Laboratory	BSP3302 Final Year Project I	BSP4314 Final Year Project II		
	BCI1103 Computer Programming	BSF1222 Industry Safety Management	BSF2112 Industry Quality Management	BPQ1223 Principles Of Operation Management	BSP3162 Composites	BSP*5*3 Elective I	UHF 2**1 Foreign Language II		
	BUM2123 Applied Calculus	BUM2413 Applied Statistics	UHC2022 Penghayatan Etika Dan Peradaban	UGE 2002 Technopreneurship	UHE 3**2 Elective Pbmsk/Science Social	BSP*5*3 Elective I			
	UQA2002 Kokurikulum	UHS1022 Soft Skills	UHL 2412 English For Academic Communication	UHL 2422 English For Technical Communication	UHL 2432 English For Professional Academic Writing Report	UHF 1**1 Foreign Language I			
	TOTAL CREDIT	18	18	17	18	15	17	13	12
	TOTAL CREDIT FOR GRADUATION	128							

### ELECTIVE COURSES FOR BACHELOR OF APPLIED SCIENCE IN MATERIAL TECHNOLOGY WITH HONOURS

NO.	CODE	COURSE	CREDIT HOUR
1	BSP3503	Solar cell technology	3
2	BSP3513	Electronic ceramics	3
3	BSP3523	Liquid crystal technology	3
4	BSP3533	Supercapacitor technology	3
5	BSP3543	Thin film technology	3
6	BSP3553	Advance solid state physics	3
7	BSP4523	Recycle technology	3
8	BSP4533	Molecular modelling	3
9	BSP4543	Semiconductor devices	3
10	BSP4553	Computational physics	3
11	BSP4563	Nanomaterial technology	3
Total minimum credits of elective courses for graduation			12*

\*Students are required to take only FOUR (4) elective courses during the study

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	<b>Synthesize materials and apply the laboratory experiences thereby providing quality products and services to the government agencies and to the materials science and technology industries locally and globally.</b>
PEO2	<b>Communicate effectively in leading and engaging multidisciplinary teams while solving materials-related problems locally and globally.</b>
PEO3	<b>Advance their knowledge and skills for the advancement of related fields and explore business opportunities in the materials science technology Industries locally and globally.</b>
PEO4	<b>Integrate ethical and professional values in managing and providing services to the recipients and provider of the materials science technology industries locally and globally.</b>

PROGRAMME OUTCOMES (PO)	
PO1	<b>Demonstrate and apply comprehensive knowledge on material science and technology.</b>
PO2	<b>Safely synthesize materials and operate a range of advanced machineries and laboratory instruments.</b>
PO3	<b>Identify problems and formulate creative and innovative solutions.</b>
PO4	<b>Communicate efficiently orally and in writing with learning communities and the public.</b>
PO5	<b>Effectively engage in a multi-disciplinary team.</b>
PO6	<b>Practice empathy, responsibilities, integrity, and professionalism in their endeavours.</b>
PO7	<b>Manage information and engage in life-long learning.</b>
PO8	<b>Apply managerial and entrepreneurial skills.</b>
PO9	<b>Demonstrate leadership characteristics.</b>

**COURSE SYNOPSIS****COURSE SYNOPSIS FOR BACHELOR OF APPLIED SCIENCE IN MATERIAL TECHNOLOGY WITH HONOURS**

BSP1153

Mechanics &amp; Thermodynamics

Credit Hour: 3

Pre-requisite: None

**Synopsis:**

This course introduces basic Physics principle in mechanics and thermodynamics field. Topics covered in this course including measurement, vectors, kinematics, Newton's law of motion, work, energy, power, fluid mechanics, static equilibrium, temperature, heat and also first law of thermodynamics. Learners need to sit for four quizzes (either offline quizzes during class or online quizzes during class week), two tests and one final examination. An assignment is also given to encourage the learners to have sufficient depth of study. First test will be held before semester break and second test before study week; which will cover certain topics. There are two main topics will be delivered to the learners; i.e., mechanics and thermodynamics. Students centred learning (SCL) approach will be applied during the class; which the learners will be the main role, whereas the lecturer's role is limited as a facilitator. Learners should be able to (i) explain theories learned to solve problems of mechanics including kinematics and dynamics and also thermodynamics, (ii) analyse the appropriate concepts learned using the right principle and laws and (iii) respond and contribute to the need of group work in assigned task; upon completion of the course.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Describe the basic conceptual knowledge of physics

CO2: Explain theories learned to solve problems of mechanics including kinematics and dynamics and also thermodynamics

CO3: Solve related problems in physics using the appropriate principles

CO4: Analyze the appropriate concepts learned using the right principle and laws of physics

CO5: Present and contribute to the need of group work in assigned task

BSP1163

Electricity, Magnetism &amp; Optics

Credit: 3

Pre-requisite: None

**Synopsis:**

Learning topics are focused on three fields: (i) electricity, (ii) magnetism, and (iii) optics physics. The stated focus is planned to be delivered during lectures; which cover twelve main chapters. For electricity, the chapters covered are: (i) electric charge & electric field, (ii) Gauss's law (iii) electric potential, (iv) capacitance & dielectric, and (v) current & resistance and (vi) DC circuit. Magnetism part is covered in (i) magnetic field and forces, (ii) sources of magnetic field, and (iii) electromagnetic induction; whereas for optics; i.e., (i) the nature of light and the law of optics, (ii) Interference and (iii) diffraction. An assignment is designed to encourage the learners to incorporate social and teamwork skills; and cultivate good presentation skills. Learners need to sit for mid-term, final semester examinations, and four quizzes (i.e., two offline quizzes during class, and two online based quizzes); to ensure sufficient theoretical and fundamental knowledge. Learners should be able to (i) explain theories learned to solve problems of electricity, magnetism and optics, (ii) analyse the appropriate concepts learned using the right principle and laws and (iii) respond and contribute to the need of group work in assigned task; upon completion of the course.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Describe the basic conceptual knowledge of physics

CO2: Explain theories learned to solve problems of electricity, magnetism and optics

CO3: Solve related problems in physics using the appropriate principles

CO4: Analyze the appropriate concepts learned using the right principle and laws of physics

CO5: Present and contribute to the need of group work in assigned task

BSP1113

Physical Chemistry

Credit: 3

Pre-requisite: None

Synopsis:

The course discusses the concepts and fundamental principles of physical chemistry. These include the properties of solid, liquid and gas, chemical equilibrium, dissolution and solution properties, chemical colloid and surface, thermodynamics, chemical kinetics and catalyst. In order to achieve technical development in the advanced technologies that requires the ultimate precision of atomic level, it is indispensable to understand the physical phenomena involved in the Industrial technology on the basis of fundamental principles

Course Outcome

By the end of semester, students should be able to:

CO1: Define the various laws in terms of chemical reactions.

CO2: Analyze /solve the given problem from physical chemistry.

CO3: Demonstrate a good ethics and professionalism in completing the given task

BSP1133

Organic Chemistry

Credit: 3

Pre-requisite: None

Synopsis:

The course is focused on basic fundamental principles of organic chemistry. The main focus is on the structure, properties and stereochemistry of organic molecules and basic organic reaction (including oxidation & reduction and radical) to prepare common functional groups. The stated focus is planned

to be delivered during lectures; which emphasize on several organic compounds including (i) alkanes, (ii) alkenes, (iii) alkynes (iv) alkyl halides, (v) alcohols, ethers & epoxides and (vi) benzene & aromatic compounds. Two assignments (mini project) is designed to encourage students to evaluate individual & teamwork skills (e.g., group activities, data handling and evaluation, work coordination and vocal presentation). A test, four quizzes and final semester examination is designed to assess student's understanding of the course. Students should be able to (i) solve the characteristics and physical properties, (ii) classify and differentiate chemical compounds based on their structures and (iii) the practice and cultivate teamwork co-operation during mini project/presentation; upon completion of the course.

Course Outcome

By the end of semester, students should be able to:

CO1: Describe characteristics and physical properties of organic molecules

CO2: Classify chemical compounds based on their structures

CO3: Recognize the main functional groups in organic chemistry and predict their reactions

CO4: Analyze of organic structure back bonds with their functional groups

CO5: Cooperate in group to complete the assigned tasks in a given time

BSP1173

Inorganics Chemistry

Credit: 3

Pre-requisite: None

Synopsis:

Learning activities are focused on foundations of bonding theory, periodic trends, synthesis and application of elements. This subject was divided to three parts. Part I consist of fundamental on atomic structures, arrangement of elements in periodic table and bonds formation in the compounds. Part II contains a systematic study of the elements and some of their compounds. This includes

the systematic survey of descriptive inorganic chemistry of the main group elements (1 to 18) including physical and chemical properties, preparation of hydride, halides, carbonates, bicarbonates, sulphates and nitrates. Part III emphasizes on the chemistry of the d-block elements including occurrence and chemical reactions. In Part I and II, the students will also expose to some glimpse at the practical uses of important classes of inorganic compounds and their industrial applications.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the basic conceptual knowledge of inorganic chemistry.

CO2: Explain theories learned to solve problems of inorganic chemistry in related task given.

CO3: Solve related problems in inorganic chemistry using the appropriate principles

CO4: Analyze the appropriate concepts learned about inorganic chemistry comprehensively.

CO5: Present and contribute to the need of group work in assigned task

BSP1422

Physics Laboratory

Credit: 2

Pre-requisite: None

#### Synopsis:

Learners are introduced to practical and hands-on activities; inclusive of (i) manipulation of instruments to conduct guided experiments, and (ii) composition of technical report. Learners need to conduct and perform the experiments based on the theory and principle learned in Mechanics & Thermodynamics and Electricity, Magnetism & Optics. Learners are expected to perform eight out of ten experiments (in group); vis., Heat Capacity of Metals with Cobra-3, Thermal Expansion in Solids and Liquids, Density of Liquids, Projectile Motion, Newton's Law of Motion with Cobra-3, Diffraction of Light at a Slit an Edge experiments, Kirchhoff's Law, Small Resistance, Dielectric Constant of Different Materials and

Transformer. Experiment demonstration, and safety talk is scheduled to be delivered by senior academician, and trained technical staff respectively; during second week of academic semester. Laboratory manual is given to each learner; which consists of theory, background of experiment, series of instructions, objectives, equipment/apparatus and references. An online forum platform (accessible via [kalam.ump.edu.my](http://kalam.ump.edu.my)) is developed for discussions purposes. Learners are divided in group of three and will be assessed based on (i) peer review, (ii) technical report, and (iii) ability to manipulate instruments (which will be carried out during a practical test). Learners are aimed to be able to (i) conduct the experiments correctly and be able to explain each of the function of the instruments used, and (ii) contribute to the need of group work.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve related problems in material science and technology using the appropriate principles

CO2: Identify and explain the function of equipment

CO3: Follow the guided experiments using the correct procedures

CO4: Present and contribute to the need of group work in assigned task

BSP1432

Chemistry Laboratory

Credit: 2

Pre-requisite: None

#### Synopsis:

Learners are introduced to practical and hands-on activities; inclusive of (i) manipulation of instruments to conduct guided experiments, and (ii) composition of technical report. Learners need to conduct and perform the experiments based on the theory and principle learned in organic, inorganic and physical chemistry. Learners are expected to perform eight experiments (in group); inclusive of, (i) melting point determination of mixed chemical, (ii) Technique of

crystallization (iii) esterification of butanol with acetic acid, (iv) reactivity of group I A elements, (v) reactivity of nitrogen and its compounds, (vi) reactivity of halogens, (vii) dissociation of a weak acid by potentiometric titration, (viii) Hess' Law and the heat of formation of magnesium oxide. Experiment demonstration, and safety talk is scheduled to be delivered by senior academician, and trained technical staff respectively; during second week of academic semester. Laboratory manual is given to each learner; which consists of theory, background of experiment, series of instructions, objectives, problem statement, and references. An online forum platform (accessible via [kalam.ump.edu.my](http://kalam.ump.edu.my)) is developed for discussions purposes. Learners are divided in group of three and will be assessed based on (i) peer review, (ii) technical report, and (iii) ability to manipulate instruments (which will be carried out during a practical test). Learners are aimed to be able to (i) conduct the experiments correctly and be able to explain each of the function of the instruments used, and (ii) contribute to the need of group work.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve related problems in organic, inorganic and physical chemistry using the appropriate principles

CO2: Identify and explain the chemical reactions of the main group elements

CO3: Follow the guided experiments using the correct procedures

CO4: Present and contribute to the need of group work in assigned task

BUM2123

Applied Calculus

Credit: 3

Pre-requisite: None

#### Synopsis:

This course introduces Polar Coordinates and Vector, Vector-Valued Functions, Partial Derivatives, and Multiple Integrals. Appropriate software is used by students to implement some of these ideas in practice.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental calculus concepts of equations and vectors

CO2: Solve and analyze various problems involving derivatives and integrals

CO3: Provide solution for a wide range of problems in science and engineering by using concept of calculus

BUM2413

Applied Statistics

Credit: 3

Pre-requisite: None

#### Synopsis:

This course discusses on statistical problem-solving methodology and descriptive statistics; sampling distribution and confidence interval; hypothesis testing; analysis of variance (ANOVA); goodness-of-fit test and contingency tables; regression and correlation including simple and multiple linear regressions. Statistical packages such as Microsoft Excel, SPSS, R Language, S Plus, EViews and Minitab shall be used in this course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of statistic

CO2: Perform statistical analysis by using appropriate statistical theory and methodology.

CO3: Analyse real life data to solve related problems in various disciplines.

BSF1212

Laboratory Safety Management

Credit: 2

Pre-requisite: None

#### Synopsis:

This course exposes students to basic

concepts of industrial and laboratory safety. Topics include quality systems (Good laboratory Practice and ISO/IEC 17025) for laboratory management, occupational health & safety and acts and related regulations. Students will be introduced to laboratory and industrial safety, laboratory and industrial accident, safety policy and procedure, emergency response plan, introduction to basic toxicology and first aid.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain the basic concept of Laboratory and Industrial safety management that comply the good practices and related regulations practices and related regulations

CO2: Apply the information related to quality system, policies, procedures and safety manuals

CO3: Present and contribute to the need of group work related to laboratory and industrial safety in assigned task

BSF2112

Industry Quality Management

Credit: 2

Pre-requisite: None

#### Synopsis:

This course focuses on the management of quality for manufacturing, service and public sectors to achieve global competitiveness. Emphasis is placed on new techniques for managing quality. This course is divided by two parts. Part one introduces quality assurance principles, including (i) Good Manufacturing Practices (GMP), (ii) ISO 9000 family and (iii) various continuous improvement techniques such as six sigma, lean manufacturing, 5S and total quality management and (iv) audit process.

Part two focuses on the quality control system, which is concerned with (i) quality control tools used in industries, (ii) acceptance sampling, (iii) statistical data analysis, (iv) reliability and maintainability, and (v) cost of quality.

Lectures will be conducted two hours per week; with one assignment throughout the semester. Learners are required to sit for one

test, and series of quizzes to ensure sufficient fundamental knowledge. Upon completion of the course, the learners should be able to (i) hypothesize alternative approaches to solve problems related to industrial quality management systems, and (ii) gather information from multiple sources related to quality assurance and quality control in industries

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the basic concept of quality assurance (QA) and quality control (QC) in industries

CO2: Analyze suitable approach to solve problems related to industrial quality management

CO3: Gather information from multiple sources related to quality assurance and quality control in industries

BPQ1223

Principles of Management

Credit Hour: 3

Prerequisite: None

#### Synopsis

The course provides a range of academic knowledge, operations understanding, operational management techniques. It will focus on the main decision areas of operations management and the role of the operations manager for productivity improvement.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Apply the fundamental concept and the main areas of operation management.

CO2: Demonstrate operation decisions in solving operational problems.

CO3: Justify operations management requirements.

BCS1023

Programming Technique



Credit: 3

Pre-requisite: None

Synopsis:

This course discusses on understanding problems and translating them into computer solution techniques using programming language. This course enables students to apply programming techniques, write programming codes from given problems and execute programming codes successfully.

Course Outcome

By the end of semester, students should be able to:

CO1: Demonstrate various techniques in solving a problem.

CO2: Construct and run programs.

CO3: Differentiate various techniques in solving a problem.

BSP2173

Solid State Physics

Credit: 3

Pre-requisite: None

Synopsis:

This course is designed to expose origin of properties of crystalline materials. The emphasis is on semiconductors, superconductors, dielectrics, and ferroelectrics; which are the basis of multibillion electronic and magnetic devices. There are five (5) headlines in this course, viz., semiconductor crystals, Fermi surface and metals, Superconductivity, Dielectrics, and Ferroelectrics. The stated focus is planned to be delivered during lectures. A problem-based assignment is designed to encourage the learners to incorporate the ethics and professional values. Learners need to sit for two tests, final semester examinations, and four quizzes to ensure sufficient theoretical and fundamental knowledge. Learners should be able to (i) develop new ideas and identify alternative approaches for problem solving related to electrical properties of crystalline solids, and (ii) demonstrate a good ethics and professionalism in completing a given task; upon completion of the course.

Course Outcome

By the end of semester, students should be able to:

CO1: Apply the basic knowledge about crystal structure and wave mechanics and explain the properties of the crystals using various model learned

CO2: Display problem solving and critical thinking skills that associated with the learned properties in the given assignment

CO3: Analyse the appropriate concepts learnt about solid state physics.

CO4: Develop new ideas and identify alternative approaches for problem solving appropriate to solid state physics

CO5: Demonstrate the ethical values and professionalism character in completing a given task

BSP2153

Material Science & Technology

Credit: 3

Pre-requisite: None

Synopsis:

This course is designed to expose the concept of structure and scaling. There are seven (7) headlines in the course; atomic structure, bonds and crystal structure, defect structure and strengthening mechanisms, failure, diffusion, material properties (mechanical, electrical, magnetic & optic), economic, and environmental issues. Student will be taught in lecture room; and the assessments which include quiz, test, assignment and final exam will be carried out throughout the semester. At the end of semester, students are expected should be able to explain, solve, analyze and develop new ideas during problem solving; related to material science and technology. Furthermore, students also should be able to demonstrate good ethics and professional skills.

Course Outcome

By the end of semester, students should be able to:

CO1: Explain theories learned to solve problems of Material Science and technology in related task given

CO2: Solve related problems in material science and technology using the appropriate principles

CO3: Analyze the appropriate concepts learned about Material Science and Technology comprehensively

CO4: Develop new ideas and identify alternative approaches for problem solving appropriate to material science and technology

CO5: Demonstrate a good ethics and professionalism in completing the given task

BSP2163

Colloid & Surface Science

Credit: 3

Pre-requisite: None

Synopsis:

The course contains two part i.e., (i) colloid, and (ii) surface science. The first section discusses about behaviour of suspension of small particles in another substance; whereas the latter discusses about properties of colloidal system e.g., surface tension, interfacial tension, and contact angle. Five state of the art methods of contact angle measurement are included in the syllabus i.e., Wilhelmy plate, Du Nuoy ring, drop-weight, spinning-drop, and maximum bubble pressure methods. Lectures will be conducted three hours per week; with two assignments throughout the semester. Learners are required to sit for two tests, and series of quizzes to ensure sufficient fundamental knowledge. Upon completion of the course, the learners should be able to (i) hypothesize alternative approaches to solve problems in respective field using fundamental approach, and (ii) demonstrate good ethics and professionalism during accomplishment of tasks.

Course Outcome

By the end of semester, students should be able to:

CO1: Explain theories learned to solve problems related to colloid and surface science in related task given.

CO2: Solve related problems in colloid and surface science using the appropriate

principles.

CO3: Analyze the appropriate concepts learned about colloid and surface science comprehensively

CO4: Develop new ideas and identify alternative approaches for problem solving appropriate to colloid and surface sciences

CO5: Demonstrate a good ethics and professionalism in completing the given task

BSP2123

Material Characterization

Credit: 3

Pre-requisite: None

Synopsis:

This course will introduce materials characterization techniques along with the analyses required for each instrument. Learning activities cover three main aspects in materials characterizations: (i) working principles, (ii) specimen preparation and (iii) analysis. Students will learn the basic principles in optical microscopes prior to learn advanced characterization like X-ray Diffraction (XRD), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM) and also Scanning Probe Microscopy. The spectroscopy techniques like Energy Dispersive X-ray, Infrared and Fourier Transform Infrared will be taught too. Characterization techniques using UV-Visible Spectrometer, Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA) are expected to enhanced the knowledge for chemical analysis and thermal analysis. Lectures will be conducted three hours per week; with two problem-based assignments throughout the semester. Students are required to sit for two tests, and series of quizzes to ensure sufficient fundamental knowledge. Upon completion of the course, the students should be able to (i) have a thorough understanding of the various types of materials analytical methods, leading to high quality characterization and measurement results, (ii) hypothesize alternative approaches to solve problems related to materials characterization techniques, and (iii) demonstrate good ethics and professionalism during accomplishment of tasks.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain theories related to principles of material's surface characterization techniques

CO2: Solve the theories and knowledge learned related to the technique in surface analysis

CO3: Analyze the appropriate problems related to the material's surface characterization comprehensively

CO4: Develop new ideas and identify alternative approaches to characterizing material's surfaces

CO5: Demonstrate the ethical values and professionalism character in completing the given task

BSP2193

Rheology

Credit: 3

Pre-requisite: None

### Synopsis:

Learning activities are focused on rheological concepts in daily life; along with definition some scientific terminologies such as (i) flow deformation, (ii) Newtonian and Non-Newtonian fluid behavior, (iii) viscometry characteristics, (iv) polymer rheology, and (v) food and surfactant behavior. The stated focus is planned to be delivered during lectures; which cover with industrial application (i.e., oil and gas production, food production, and packaging production). Industry visit to food and packaging-based companies (e.g., Grandeur Chocolate Industries & Yakult (M) SDN BHD) is scheduled; to ensure sufficient industrial exposure to the learners. Assignment is given to further strengthen the understanding of the course. The activities incorporated in this course are to create an active participation (psychomotor/ critical thinking & problem solving) during the lecture sessions. Learners need to sit for mid-term, final semester examinations, and four quizzes; to ensure sufficient theoretical and fundamental knowledge. Learners should be able to (i) hypothesize alternative approaches to solve problems using the knowledge of rheology,

and characterizations in industry and research domains, and (ii) practice and cultivate entrepreneurial skills during presentation of idea; upon completion of the course.

### Course Outcome

By the end of semester, students should be able to:

CO1: Maintaining good ethics and professionalism in completing the given task.

CO2: Analyze the appropriate concepts learned about rheology.

CO3: Explain the theories involved to solve the problems associated with rheology along with necessary principles.

CO4: Solve the problem with the appropriate concepts learned about rheology and rheological properties.

CO5: Develop and identify alternative approaches for problem solving appropriate to rheology.

BSP2422

Material Science & Solid-State Lab

Credit: 2

Pre-requisite: None

### Synopsis:

This course introduces students to fundamentals of experiment in material science and solid-state field; which includes mechanical, electrical and optical measurements. Students will experience hands on learning using related experimental set ups and methods, quantitative and qualitative characterization of materials, and composition of scientific report. Experiment demonstration, and safety talk is scheduled to be delivered by senior academician, and trained technical staff respectively; during second week of academic semester. Laboratory manual is given to each learner; which consists of theory, background of experiment, series of instructions, objectives, problem statement, and references. An online forum platform (accessible via [kalam.ump.edu.my](http://kalam.ump.edu.my)) is developed for discussions purposes. Learners are divided in group of nine; required to perform nine experiments, which will be assessed based on (i) peer review, (ii) technical report, and (iii)

ability to manipulate instruments for characterizations (which will be carried out during a practical test). Learners are aimed to develop psychomotor skills in manipulation of instruments to characterize properties of the synthesized/prepared materials using various laboratory instruments and advanced machineries.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve related problems in material science and technology using the appropriate principles

CO2: Follow the guided experiments using the correct procedures

CO3: Organize and complete with confidence the experiments using the correct procedures

CO4: Initiate and commit to participate in gaining and sharing knowledge.

BSP2432

Rheology & Colloid Lab

Credit: 2

Pre-requisite: None

#### Synopsis:

In this course, learners will study on material properties through laboratory experiments. This course consists of two related field of study, colloidal systems and rheology. Learning activities are focused on the practical and hands-on activities; inclusive of (i) manipulation of instruments to perform synthesis/preparation of materials, quantitative and qualitative characterization of materials, and (ii) composition of scientific report. Learners need to prepare, and characterize Newtonian and non-Newtonian fluids; melting temperature of polymer, surface tension, contact angle of fluid, colloidal behaviour and hydrophobic and hydrophilic behaviour. Experiment demonstration, and safety talk is scheduled to be delivered by senior academician, and trained technical staff respectively; during second week of academic semester. Laboratory manual is given to each learner; which consists of theory, background of experiment, series of instructions, objectives,

problem statement, and references. An online forum platform (accessible via [kalam.ump.edu.my](http://kalam.ump.edu.my)) is developed for discussions purposes. The class is divided into groups. Each group will perform different experiment each week which will be assessed based on (i) peer review, (ii) technical report, and (iii) ability to manipulate instruments for characterizations (which will be carried out during a practical test). Learners are aimed to develop psychomotor skills in manipulation of instruments to characterize properties of the synthesized/prepared materials; i.e., DATAPHYSICS Contact angle using sessile drop method, Brookfield Viscometry, Melt Flow Indexer and De Nouy Ring Surface Tension.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Analyze an experimental data and be able to relate with theories learned.

CO2: Follow the guided experiments using the correct procedures

CO3: Conduct and complete with confidence the experiments using the correct procedures

CO4: Initiate and commit to participate in gaining and sharing knowledge

BSP3112

Ceramics

Credit: 2

Pre-requisite: None

#### Synopsis:

This course exposes students to ceramic materials in general. Learning activities cover several main aspects of ceramics: i.e. (i) The crystal structure of ceramics, (ii) the grain growth of ceramics during sintering, (iii) oxide and non-oxide ceramics, (iv) defects in ceramics, (v) interfaces in polycrystal ceramics, (vi) phase boundaries and (vii) mechanical properties of ceramics. Lectures will be conducted two hours per week; with two assignments throughout the semester. Learners are required to sit for two tests, and series of quizzes to ensure sufficient fundamental knowledge. Upon completion of the course, the learners should be able to (i)

hypothesize alternative approaches to solve problems related to ceramics using fundamental approach, and (ii) demonstrate good ethics and professionalism during accomplishment of tasks.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain theories learned to solve problems of ceramic in related task given.

CO2: Solve related problems in ceramic using the appropriate principles

CO3: Analyze the appropriate concepts learned about ceramic comprehensively

CO4: Develop new ideas and identify alternative approaches for problem solving appropriate to ceramic

CO5: Complete the given task by relate with empathy, responsibility, integrity and social issues related to ceramic

BSP3153

Polymers

Credit: 3

Pre-requisite: None

#### Synopsis:

Polymers study requires a good understanding of fundamental knowledge of sciences; which involves investigation of structure, properties, polymerization process, characterization, viscoelasticity, rheology and molecular weight. This course also will cover industrial polymers and technology, including engineering and specialty polymers, industrial polymerization technique and polymer processing. Learning activities are planned to be delivered during lectures which will focused on (i) Introduction to polymers (i.e., classification, structure and molecular weight), (ii) Polymerization process (i.e., step-growth polymerization, chain growth polymerization, polymerization conditions and polymer reactions), (iii) Polymerization techniques (i.e., bulk, solution, suspension, emulsion), (iv) Characterization (i.e., measurement of molecular weight, analysis and testing of polymers), (v) Solid-state properties of polymers (i.e., Amorphous state, crystalline state, thermal transition properties and

mechanical properties), (vi) (Viscoelasticity and rubber elasticity (i.e., mechanical models of viscoelastic behaviour, introduction to rubber elasticity), (vii) Thermoplastic, thermosets and elastomers (i.e., general purposes thermoplastic, engineering thermoplastic, thermosets and elastomers (natural rubber and synthetic rubber), (viii) (Polymer processing (i.e., extrusion, moulding, calendaring additives and compounding). Industry visit to polymers-based company (i.e., Polyplastic, Kaneka, MTBE Petronas, Gebeng) is scheduled; to ensure sufficient exposure to polymers manufacture and processing in industry to the students. Two problem-based assignments are designed to develop students' ability to analyze and carry out polymer investigations, apply theoretical knowledge, and write a good technical report. Students need to sit for test 1, test 2, final semester examinations, and four quizzes (i.e., two offline quizzes during class, and two online-based quizzes); to ensure sufficient theoretical and fundamental knowledge. Students should be able to (i) apply comprehensive knowledge, identify problems and formulate creative and innovative solutions in polymer manufacture, and processing in industry, and (ii) practice empathy, responsibilities, integrity, and professionalism in their endeavours; upon completion of the course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain theories learned to solve problems of polymer in related task given.

CO2: Solve related problems in polymers using the appropriate principles

CO3: Analyze the appropriate concepts learned about polymers comprehensively

CO4: Develop new ideas and identify alternative approaches for problem solving appropriate to polymers.

CO5: Complete the given task by relate with empathy, responsibility, integrity and social issues related to polymers.

BSP3162

Composites

Credit: 2

Pre-requisite: None

Synopsis:

This course exposes students to composites materials in general. Learning activities cover several main aspects of composites: i.e. (i) composites matrices and their properties, (ii) specialty and high-performance thermosets, (iii) thermoplastic composites, (iv) ceramic and metal matrix composites, (v) reinforcement, (vi) composite design and (vii) the application of composites. Lectures will be conducted two hours per week; with two assignments throughout the semester. Learners are required to sit for two tests, and series of quizzes to ensure sufficient fundamental knowledge. Upon completion of the course, the learners should be able to (i) hypothesize alternative approaches to solve problems related to composites using fundamental approach, and (ii) demonstrate good ethics and professionalism during accomplishment of tasks.

Course Outcome

By the end of semester, students should be able to:

CO1: Explain theories learned to solve problems of composites in related task given.

CO2: Solve related problems in composites using the appropriate principles

CO3: Analyze the appropriate concepts learned about composites comprehensively

CO4: Develop new ideas and identify alternative approaches for problem solving appropriate to composites

CO5: Complete the given task by relate with empathy, responsibility, integrity and social issues related to composites

BSP3183

Failure Analysis

Credit: 3

Pre-requisite: None

Synopsis:

Learning activities are focused on principles and general procedures of failure analysis in metallic, polymeric, ceramic, and electronic materials. The stated focus planned to be

delivered during lectures are;(i) basic features and characteristics of different failure mechanisms, and (ii) methods and procedures to determine the cause of the failures. Industry visit to companies is scheduled; to ensure sufficient knowledge of failure analysis procedure in industry to the learners. A hands-on assignment is designed to enhance learner's skills in identifying the material's flaw, surface and sub-surface (e.g., cracks, seams, shrinkages, porosity, incomplete root penetration, undercut, lack of fusion). Learners need to sit for mid-term, final semester examinations, and four quizzes (i.e., two offline quizzes during class, and two online-based quizzes); to ensure sufficient theoretical and fundamental knowledge. Learners should be able to (i) explain and compare the basic features and characteristics of different failure mechanisms, (ii) solve related problems of failures using appropriate methodology and tools, and (ii) develop new idea and create alternative approaches for problem solving of various case studies; upon completion of the course.

Course Outcome

By the end of semester, students should be able to:

CO1: Explain and compare the basic features and characteristics of different failure mechanisms.

CO2: Solve related problems of failures using appropriate methodology and tools.

CO3: Differentiate and analyze the procedures that can help determine the cause of the failures.

CO4: Develop new idea and create alternative approaches for problem solving of various case studies.

CO5: Complete the given task by cooperating in group while perform good ethics and professionalism during discussion.

BSP2133

Metals & Alloys

Credit: 3

Pre-requisite: None

Synopsis:

Metals and alloys study require a good understanding of fundamental knowledge of sciences; which involves investigation of chemical and physical properties of metallic elements, compounds and alloys. The course will cover metal-related technologies and metalworking processes such as casting, forging and sintering. Learning activities are planned to be delivered during lectures which will focused on (i) fundamental of crystal bonding and defects (i.e., atomic bonding in solids, imperfection, and diffusions), (ii) phase diagrams (i.e., interpretation of phase diagram, eutectic system, eutectoid system, and iron-carbon diagram), (iii) heat treatment processes (i.e., annealing, tempering, and surface hardening), (iv) ferrous and non-ferrous metals (i.e., steels classification, cast iron, and alloys), (v) metal fabrications, and (vi) mechanical properties and testing of metals. Industry visit to metal-based company (i.e. Asturi Metal Builder (M) Sdn Bhd) is scheduled; to ensure sufficient exposure of metal fabrication and processing in industry to the learners. Two problem-based assignments are designed to develop learners' ability to analyze and carry out metallurgical investigations, apply theoretical knowledge, and write a good technical report. Learners need to sit for test 1, test 2, final semester examinations, and four quizzes (i.e., two offline quizzes during class, and two online-based quizzes); to ensure sufficient theoretical and fundamental knowledge. Learners should be able to (i) apply comprehensive knowledge, identify problems and formulate creative and innovative solutions in metals and alloys processing, and fabrications in industry, and (ii) practice empathy, responsibilities, integrity, and professionalism in their endeavours; upon completion of the course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain theories learned to solve problems of metal and alloy in related task given

CO2: Solve related problems in metal and alloy using the appropriate principles

CO3: Analyze the appropriate concepts learned about metal and alloy

comprehensively

CO4: Develop new ideas and identify alternative approaches for problem solving appropriate to metal and alloy

CO5: Demonstrate a good ethics and professionalism in completing the given task

BSP3173

Corrosion

Credit: 3

Pre-requisite: None

#### Synopsis:

Learning activities are focused on (i) introduction to corrosion (i.e., main reasons to study corrosion), (ii) mechanism (i.e., polarization, passivation, and corrosion rate,) (iii) types of corrosion, and (iv) corrosion control (material selection, corrosion inhibitor, cathodic and anodic protection). This course will be delivered via lectures; which begin with explanation on the principle of corrosion including elated electrochemical reactions, polarization and passivity as well as applications of thermodynamics to corrosion and electrode kinetics. All types of corrosion namely aqueous and non-aqueous corrosion, atmospheric corrosion, biological corrosion, and corrosion in selected environments such as soil, concrete, marine and sulphur bearing solutions are discussed. Introduction on basic principle of corrosion control for all types of corrosion are also discussed. A problem-based assignment is designed to develop learners' ability to analyze and carry out corrosion investigations, apply theoretical knowledge, and develop technical report writing skills. Learners need to sit for mid-term, final semester examinations, and four quizzes (i.e., two offline quizzes during class, and two online-based quizzes); to ensure sufficient theoretical and fundamental knowledge. Learners should be able to (i) apply comprehensive knowledge, identify problems and formulate creative and innovative solutions to corrosion problems in industry, (ii) practice empathy, responsibilities, integrity, and professionalism in their endeavours, and (iii) apply managerial, entrepreneurial skill, and demonstrate leaderships characteristics; upon completion of the course.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain theories learned to solve problems of corrosion & corrosion control in related task given

CO2: Solve related problems in corrosion & corrosion control using the appropriate principles

CO3: Analyze the appropriate concepts learned about corrosion & corrosion control comprehensively

CO4: Develop new ideas and identify alternative approaches for problem solving appropriate to corrosion & corrosion control

CO5: Demonstrate a good ethics and professionalism in completing the given task

BSP3462

Polymer & Composite Lab

Credit: 2

Pre-requisite: None

### Synopsis:

This course consists of three related field of study, polymer, composite. Learners are introduced to practical and hands-on activities; inclusive of (i) manipulation of instruments to perform synthesis/preparation of materials, quantitative and qualitative characterization of materials, and (ii) composition of scientific report. Learners need to synthesis, prepare and characterize polymer and composite; using step-growth, free radical, resin transfer moulding, press laminating and extruder. Experiment demonstration, and safety talk is scheduled to be delivered by senior academician, and trained technical staff respectively; during second week of academic semester. Laboratory manual is given to each learner; which consists of theory, background of experiment, series of instructions, objectives, problem statement, and references. An online forum platform (accessible via [kalam.ump.edu.my](http://kalam.ump.edu.my)) is developed for discussions purposes. The class is divided into groups. Each group will perform different experiment each week which will be assessed based on (i) peer review, (ii) technical report, and (iii) ability to synthesis polymers (which

will be carried out during a practical test). Learners are aimed to develop psychomotor skills in manipulation of instruments to characterize properties of the synthesized/prepared materials; i.e., FTIR, DSC, TGA, UTM, XRD, compression, tensile and impact.

### Course Outcome

By the end of semester, students should be able to:

CO1: Solve problem using experimental procedure to accomplish given objectives during material synthesis and characterization, and device fabrication

CO2: Follow the guided experiments using the correct procedures

CO3: Manipulate instruments to accomplish given objectives using correct procedure

CO4: Demonstrate the ability to deliver and participate in knowledge sharing

BSP3472

Metal & Ceramic Lab

Credit: 2

Pre-requisite: None

### Synopsis:

This course consists of two related field of study, metal and ceramic. Learners are introduced to practical and hands-on activities; inclusive of (i) manipulation of instruments to perform synthesis/preparation of materials, quantitative and qualitative characterization of materials, and (ii) composition of scientific report. Learners need to synthesis, prepare and characterize metal and ceramic; using sol-gel, solid state reaction and metallography. Experiment demonstration, and safety talk is scheduled to be delivered by senior academician, and trained technical staff respectively; during second week of academic semester. Laboratory manual is given to each learner; which consists of theory, background of experiment, series of instructions, objectives, problem statement, and references.

An online forum platform (accessible via [kalam.ump.edu.my](http://kalam.ump.edu.my)) is developed for discussions purposes. The class is divided



into groups. Each group will perform different experiment each week which will be assessed based on (i) peer review, (ii) technical report, and (iii) ability to conduct experiment and synthesis metal and ceramic (which will be carried out during a practical test). Learners are aimed to develop psychomotor skills in manipulation of instruments to characterize properties of the synthesized/prepared materials; i.e., UTM, XRD, metallurgical microscopy and vickers hardness.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve problem using experimental procedure to accomplish given objectives during material synthesis and characterization, and device fabrication

CO2: Follow the guided experiments using the correct procedures

CO3: Manipulate instruments to accomplish given objectives using correct procedure

CO4: Demonstrate the ability to deliver and participate in knowledge sharing

BSP3452

Advance Material Lab

Credit: 2

Pre-requisite: None

#### Synopsis:

Learners are introduced to practical and hands-on activities; inclusive of (i) manipulation of instruments to perform synthesis/preparation of materials, quantitative and qualitative characterization of materials, and (ii) composition of scientific report. Learners need to synthesis functional materials i.e., quantum dots, nanowires, nanoparticles, liquid crystals, organic dyes, organometallic frameworks, and solid polymer electrolytes; using wet chemical process, electrospinning machine, and microwave technique. Demonstration, and safety talk is scheduled to be delivered by senior academician, and trained technical staff respectively; during second week of academic semester. Laboratory manual is given to each learner; which consists of theory, background of experiment, series of instructions,

objectives, problem statement, and references. An online forum platform (accessible via [kalam.ump.edu.my](http://kalam.ump.edu.my)) is developed for discussions purposes. Learners are divided in group of three; required to perform ten experiments, which will be assessed based on (i) peer review, (ii) technical report, and (iii) ability to manipulate instruments for characterizations (which will be carried out during a practical test). Learners are aimed to develop psychomotor skills in manipulation of instruments to characterize properties of the synthesized/prepared materials; i.e., Ball Miller, Ultra Violet-Visible absorption spectrometer, Photoluminescence spectrometer, Fourier Transformed Infra-Red spectrometer, Polarized Light Microscope, Thermogravimetric Analysis, Potentiostat-Galvanostat, X-Ray Diffractometer, and Ab-Initio Density Functional Theory calculations.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve problem using experimental procedure to accomplish given objectives during material synthesis and characterization, and device fabrication

CO2: Follow the guided experiments using the correct procedures

CO3: Manipulate instruments to accomplish given objectives using correct procedure

CO4: Demonstrate the ability to deliver and participate in knowledge sharing

BSP4172

Material Selection & Processing

Credit: 2

Pre-requisite: None

#### Synopsis:

The course is designed to offer a generic and broad view of material selection and processing technology. Learning activities are focused on industrial scale-material selection and processing concepts; such as (i) product identification, (ii) design and concept education, (iii) materials selection (iv) product development, and (v) product presentation. This course will provide learners an

opportunity to develop personal skills and knowledge while working with metal, polymer, ceramic and composite materials which commonly used in the manufacturing and construction industries. Industry visit to polymer and metal production-based companies (e.g., Top Glove Sdn Bhd, Asturi Sdn Bhd & Amsteel Sdn Bhd) is scheduled; to ensure sufficient industrial exposure to the learners. Assignment is given to further strengthen the understanding of the course. The activities incorporated in this course are to create an active participation (psychomotor/critical thinking & problem solving) during the lecture sessions. Learners need to sit for mid-term, final semester examinations, and four quizzes; to ensure sufficient theoretical and fundamental knowledge. Learners should be able to (i) hypothesize alternative approaches to solve problems using the knowledge of rheology, and characterizations in industry and research domains, and (ii) practice and cultivate entrepreneurial skills during presentation of idea; upon completion of the course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain the theories involved to solve the problems associated with material selection and processing.

CO2: Solve the problem with the appropriate concepts learned about materials processing and theological properties.

CO3: Analyze the appropriate technique of material selection and processing

CO4: Develop and plan a solution for the existing technology of material selection and processing.

CO5: Propose a scientific report effectively in written form

BSP3302

Final Year Project I

Credit: 2

Pre-requisite: None

#### Synopsis:

Learning activities are focused on developing workable research proposal comprising

identification of (i) problem statement, (ii) research objectives and question, (iii) literature reviews and (iv) research methodology. Each student is assigned to an advisor (lecturer); based on field of expertise. The stated focus is planned to be delivered by direct active/engaged learning with the advisor (weekly basis); to understand the direction of project. Students are also required to gather information through reading of recently published articles on related field. Identification of chemicals and suitable characterization tools to ensure completion of project will be finalized and justified with guidance of advisor. A problem-based assignment is designed to encourage the students to incorporate managerial skills (e.g., project management, research ethics, time management and log book keeping). Students are assessed based on written proposal, and efficiency of communications of research strategies during oral presentation. Students will continue lab work upon approval of proposal by faculty members. Learners should be able to analyze appropriate techniques and suitable solutions to be applied for their project upon completion of the course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Apply appropriate principles of material science and technology to the given research project.

CO2: Analyze the appropriate techniques and suitable solutions to be applied in research project.

CO3: Explain effectively in written and oral form through project proposal presentation.

CO4: Organize in a given research task and identify own responsibility in a project and behave accordingly.

CO5: Demonstrate a good ethics and professionalism in completing the given task.

BSP4314

Final Year Project II

Credit: 4

Pre-requisite: BSP4314 Final Year Project I

#### Synopsis:

This course is a continuation of BSP3023–

Final Year Project II. Learning activities are directed on completion of individual research project (by advisor monitoring), thesis preparation and project presentation. The stated focus is planned to be delivered by active/engaged learning with advisor, practical laboratory work, self-reading and draft preparation. Students will gather suitable data to answer research objectives; handling data analysis and discussion prior thesis writing. Students are assessed based on complete draft of thesis; effective communications of their findings during oral presentation and log book arrangement. At the end of this term, each student is expected to submit a fully developed and presented project that reflects the student's command of the tools and processes of material technology knowledge.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Apply appropriate principles of material science and technology to the given research project.

CO2: Construct the experiment independently in a given task.

CO3: Develop new ideas and identify alternative approaches for problem solving appropriate to research project.

CO4: Explain effectively in written and oral form through project proposal presentation.

CO5: Identify new ideas and information from multiple sources independently and organize into meaningful categories.

BSP4812

Industrial Training

Credit Hour: 12

Prerequisite: All faculty and programme courses

#### Synopsis

This course aims to give chances for the student to practise and apply their knowledge and skills that they gain during their study. During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Student are supervised by industrial and university supervisors to guide

and ensure they can do their work as good as possible and achieve the objective for this course. Then, student need to provide industrial training report to describe their technical and personal development during their placement. The industrial training report need to hand in to the university supervisor. Student need to do final presentation for assessment.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Adapt working culture in project, consultant, construction and related industry.

CO2: Organize the industrial training knowledge, experience and skill in the preparation of the industrial training report.

CO3: Build effective communication skills in written and oral presentation.

BSP3503

Solar Cell Technology

Credit: 3

Pre-requisite: None

#### Synopsis:

Learning activities are focused on (i) fundamental of photoelectric conversion (i.e., charge excitation, transportation, separation, and collection), (ii) mechanisms (i.e., electron injection efficiencies, energy loss, and multi exciton generation), (iii) fabrications, and (iv) characterizations of solar cell. The stated focus are planned to be delivered during lectures; which cover four main technologies (i.e., mono-crystalline, thin film, dye sensitized, and quantum dots solar cell). Industry visit to solar cell-based companies (e.g., AUO Sunpower Sdn Bhd, RadTech Sdn Bhd, and HBE Gratings Sdn Bhd) is scheduled; to ensure sufficient exposure of Silicon-based solar cell processing in industry to the learners. A problem-based assignment is designed to encourage the learners to incorporate technopreneurial skills (e.g., identifying new materials for solar cell, proposing a business plan, and installation of solar cell during community service activity). Learners need to sit for mid-term, final semester examinations, and four quizzes (i.e.,

two offline quizzes during class, and two online-based quizzes); to ensure sufficient theoretical and fundamental knowledge. Learners should be able to (i) hypothesize alternative approaches to solve problems in solar cell fabrications, and characterizations in industry and research domains, and (ii) practice and cultivate entrepreneurial skills during presentation of idea; upon completion of the course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve related problems in solar cell technology using appropriate principles

CO2: Analyze the appropriate concepts learned about solar cell technology comprehensively

CO3: Develop new ideas and identify alternative approaches for problem solving in solar cell technology

CO4: Identify the ability to incorporate entrepreneur skills in assigned task

CO5: Demonstrate leadership characteristics in assigned task

#### BSP3513

Electronic Ceramic

Credit: 3

Pre-requisite: None

#### Synopsis:

This course introduces and discusses the types and properties of electronic ceramics. The course covers ceramic materials for such applications; i.e., conductor, magnetic materials, electro-optic materials, superconductor, pyroelectric and piezoelectric materials as well as their fabrication and characterizations. Industrial visit is planned to introduce students in depth understanding for electronic ceramics applications. Students will be assigned to have a topic of electronic ceramics application and give a presentation to incorporate with technopreneurial skills. Written test such as quizzes (both offline and online), mid-term test and final test will be given to evaluate the students learning. Upon completion of the course, the students are able to solve the basic problem of electronic

ceramics development and applications as well the capability in analyzing and providing the alternative solution of problem regarding the electronic ceramics applications.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve the basics problems associated with electronic ceramic

CO2: Analyze the appropriate concepts learned about electronic ceramic.

CO3: Plan a solution for the existing technology and discuss the method involved to solve problem in electronic ceramic

CO4: Identify the ability to incorporate entrepreneur skills assigned work

CO5: Demonstrate leadership characteristics in assigned work

#### BSP3523

Liquid Crystal Technology

Credit: 3

Pre-requisite: None

#### Synopsis:

This course covers the basic concept of liquid crystals along with technology review such as anisotropic fluids, phase of liquid crystals, chemistry of liquid crystal, alignment of liquid crystals, photoisomerization effects in liquid crystals, and the future aspects of LCD. Industrial visit is planned to introduce students in depth understanding for development and current issue of LCD. Industrial visit is planned to introduce students in depth understanding for the LCD technology and recent issues. Students will be assigned to have a topic of electronic ceramics application and give a presentation to incorporate with technopreneurial skills. Written test such as quizzes (both offline and online), mid-term test and final test will be given to evaluate the students learning. Upon completion of the course, the students are able to solve the basic problem of LCD development as well the capability in analysing and providing the alternative solution of problem regarding the LCD technology development.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve the basics problems associated with liquid crystals and liquid crystal technology

CO2: Analyze the appropriate concepts learned about liquid crystals and liquid crystal technology

CO3: Plan a solution for the existing technology and discuss the method involved to solve

CO4: Identify the ability to incorporate entrepreneur skills assigned work

CO5: Demonstrate leadership characteristics in assigned work

BSP3533

Supercapacitor Technology

Credit: 3

Pre-requisite: None

Synopsis:

The course is focused on (i) fundamental of energy storage protocols (i.e., capacitors, batteries, supercapacitors, and link between energy and power requirements), (ii) supercapacitor principles (i.e., electrochemical double layer capacitance, pseudo-capacitance, hybrids and device taxonomy), (iii) fabrications (i.e., positive electrode, negative electrode, electrolyte and assembly selection), and (iv) characterizations (i.e., setup configuration, cyclic voltammetry, charge-discharge, electrochemical impedance spectroscopy and procedure to evaluate device performance). The stated focus is planned to be delivered during lectures; which emphasize on the recent advancement on supercapacitors technology (including symmetric supercapacitor, asymmetric supercapacitor, solid state supercapacitor, advancement on electrode materials and applications). Industry visit to supercapacitor-related companies is scheduled; to ensure sufficient exposure of device assembly in industry to the students. A hands-on based assignment (mini project) is designed to encourage students to incorporate managerial and leadership skills (e.g., group activities, data handling and

evaluation, work coordination and vocal presentation). A mid-term, four quizzes and final semester examination is designed to assess student's understanding of the course. Students should be able to (i) solve problems in supercapacitor fabrications, and characterizations in industry and research domains, and (ii) identify energy-power density requirement in certain device/application and (iii) the practice and cultivate managerial skills during mini project/presentation; upon completion of the course.

Course Outcome

By the end of semester, students should be able to:

CO1: Solve related problems in supercapacitor technology using the appropriate principles

CO2: Analyze the appropriate concepts learned about supercapacitor technology comprehensively

CO3: Develop new ideas and identify alternative approaches for problem solving appropriate to supercapacitor technology

CO4: Identify the ability to incorporate managerial skills in assigned task

CO5: Demonstrate leadership characteristics in assigned task

BSP3543

Thin Film Technology

Credit: 3

Pre-requisite: None

Synopsis:

This course exposes students to overview the Thin Film Technology in various industries. This course covers methods of deposition, deposition growth, and thin film properties such as optical, electrical, magnetic and mechanical properties. The reactions and several techniques for thin film characterization are also discussed in details in the second half semester. Industrial visit is planned to introduce students in depth understanding for thin film applications. Students will be assigned to discuss a topic of thin film application and deliver a presentation to encourage them to practice

technopreneurial skills. Written test such as quizzes (both offline and online), mid-term test and final test will be given to evaluate the students learning output. Upon completion of the course, the students are able to solve the basic problem of thin film applications as well the capability in analysing and providing the alternative solution for problem solving regarding the thin film technology and their applications.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve the basic problems associated with preparation of thin film using the appropriate principles.

CO2: Analyze the appropriate concepts learned to solve a given situations in thin film technology comprehensively.

CO3: Develop new ideas and identify alternative approaches for problem solving appropriate to thin film technology

CO4: Identify the ability to incorporate entrepreneur skills in assigned task

BSP4523

Recycle Technology

Credit: 3

Pre-requisite: None

#### Synopsis:

Material resources to support our industrial age have become increasingly scarce. On the other hand, garbage or trashes or solid wastes resulted from our economic system that urges disposable lifestyles have become difficult problem to solve for those responsible for their management. Much of these discarded materials which could not be otherwise reused, sold, or salvaged may contain valuable amount of materials and or energy if appropriate technology and management are applied to convert these wastes to wealth. This course deals with materials recycling and recovery. The course content includes four parts, i.e. (1) Principles of Solid Waste Management, (2) Materials Recycling, (3) Hazardous Waste Recovery, and (4) Future Strategies for Waste Management.

A problem-based assignment is designed to encourage the learners to incorporate technopreneurial skills (e.g., identifying materials to be recycled, proposing a business plan and recycling methods). Learners need to sit for mid-term, final semester examinations, and four quizzes (i.e., two offline quizzes during class, and two online-based quizzes); to ensure sufficient theoretical and fundamental knowledge.

Learners should be able to (i) hypothesize alternative approaches to solve problems related to recycle technology, and (ii) practice and cultivate entrepreneurial skills during presentation of idea; upon completion of the course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve related problems in recycle technology using the appropriate principles

CO2: Analyze the appropriate concepts learned about recycle technology comprehensively

CO3: Develop new ideas and identify alternative approaches for problem solving appropriate to recycle technology

CO4: Identify the ability to incorporate managerial skills in assigned task

CO5: Demonstrate leadership characteristics in assigned task

BSP4533

Molecular Modelling

Credit: 3

Pre-requisite: None

#### Synopsis:

The course emphasized on validation of realistic cluster model using state of the art modelling tool i.e., Ab Initio Density Functional Theory calculations. The calculations and modelling procedure are planned to be carried out using Gaussian 09W, and Gaussview 5.0 respectively. Five important analysis of materials are included in the syllabus i.e., structure, opto-electronic, reduction–oxidation energy level, adsorption– desorption mechanisms, and electron dynamics in opto-

electronic devices. A combination of lecture and hands-on activities is designed to ensure sufficient experience, and efficient delivery. Additionally, two visits are planned i.e., (i) Advanced Analysis and Modelling (ADAM), and Advanced Computing facilities at MIMOS Berhad, and (ii) DFT simulation facility at Universiti Malaysia Terengganu; to expose the learners to available career in the respective field. Learners are expected to accomplish a problem-based assignment; which needs combination of realistic cluster modelling, and technopreneurial skills. Learners are required to sit for a test, four quizzes (i.e., two offline quizzes during class, and two online-based quizzes) to ensure sufficient theoretical and fundamental knowledge. Upon completion of the course, the learners should be able to (i) hypothesize alternative approaches to solve problems in respective field using realistic cluster modelling procedure, and (ii) practice entrepreneurial skills during presentation of idea.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve problems related to realistic modelling using appropriate principles

CO2: Analyze the appropriate concepts learned about density functional theory calculations comprehensively

CO3: Construct realistic cluster model using correct procedure to accomplish given problem

CO4: Identify the ability to incorporate managerial skills in assigned task

CO5: Demonstrate leadership characteristics in assigned task

BSP4543

Semiconductor Devices

Credit: 3

Pre-requisite: None

#### Synopsis:

This course introduces the major application of solid state physics. This course covers the most basic semiconductor devices as a p-n junction, JFET, MOSFET, MESFET as well as

the fabrication techniques of the devices on silicon wafer. The application of the devices for diode, LED, photodetector and solar cell are also introduced. Industrial visit is planned to introduce students in depth understanding for semiconductor devices fabrication. Students will be assigned to have a topic of semiconductor devices application and give a presentation to incorporate with technopreneurial skills. Written tests such as quizzes (both offline and online), mid-term test and final test will be given to evaluate the students learning. Upon completion of the course, the students are able to solve the basic problem of semiconductor devices applications as well the capability in analyzing and providing the alternative solution of problem regarding the semiconductor devices fabrication and their applications.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve the basics problems associated with semiconductor devices

CO2: Analyze the appropriate concepts learned about semiconductor devices.

CO3: Plan a solution for the existing technology and discuss the method involved to solve

CO4: Identify the ability to incorporate entrepreneur skills assigned work

CO5: Demonstrate leadership characteristics in assigned work

BSP4553

Computational Physics

Credit: 3

Pre-requisite: None

#### Synopsis:

This course will introduce techniques and applications in computational Physics. This course focuses specifically on methods for solving Physics/Mathematics problems using modern computational tools such as MATLAB, MAPLE or MATHEMATICA or etc. The emphasis of the course will be on using computational methods to solve physics problems that cannot be solved analytically. Student will be taught about theory in lecture

room and hands on practice in laboratory. At the end of semester, student should be able to plan a solution to solve Physics problem. Furthermore, student should be able to incorporate managerial and express their leadership skills.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve physics problems using appropriate tools and technique

CO2: Analyze problems using appropriate methods

CO3: Plan a solution for a given problem and discuss the method involved comprehensively

CO4: Identify the ability to incorporate managerial skills in assigned task

CO5: Express leadership characteristics in assigned task

BSP4563

Nanomaterial Technology

Credit: 3

Pre-requisite: None

#### Synopsis:

Learning activities are focused on (i) basic theory, (ii) classification of nanomaterials (i.e., 0-D, 1-D, 2-D and 3-D), (iii) synthesis of nanomaterials (i.e., inert-gas inspection, sol-gel deposition, molecular self-assembly, physical vapor deposition and milling mechanical alloying), (iv) characterization techniques (i.e., scanning tunnelling microscope, atomic force microscope, energy dispersive spectroscopy and Raman spectroscopy technique), and (v) application of nanomaterials in science and technology. The stated focus is planned to be delivered during lectures; which cover the functions of nanomaterials (i.e., nano-sensors, carbon nanotubes, quantum dots nanoparticles) which acts as optical, chemical and biosensors in various applications (i.e., food and agriculture, medical, water treatment and automotive industry). A project-based assignment is designed to enhance learner's cognitive and psychomotor skills (e.g., nanostructures in nature and nanomaterial in art and culture heritage). Learners need to sit

for mid-term, final semester examinations, and four quizzes (i.e., two offline quizzes during class, and two online-based quizzes); to ensure sufficient theoretical and fundamental knowledge. Learners should be able to (i) explain and solve related problems in nanotechnology based on the tools, methods and applications and (ii) develop new idea and create alternative approaches for problem solving by considering the concerns and challenges in nanotechnology; upon completion of the course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Solve related problems of nanotechnology based on their tools, methods and applications.

CO2: Analyze the nanomaterial and nanostructures for future application

CO3: Develop new ideas and identify alternative approaches for problem solving appropriate to supercapacitor technology

CO4: Identify the ability to incorporate managerial skills in assigned task

CO5: Demonstrate leadership characteristics in assigned task

BSP3553

Advance Solid-State Physics

Credit: 3

Pre-requisite: None

#### Synopsis:

This course is designed to expose wave mechanics and wave propagation through crystals, fundamental and reciprocal lattice types, Brillouin zones, lattice vibrations, phonon, density of state, Debye and Einstein model of specific heats, Fermi free electron, Hall effect, energy band, Bloch functions, Kronig Penney model. There are seven (7) headlines in the course; introduction to quantum mechanics, Schrodinger equation, reciprocal lattice vectors, crystal vibrations, Fermi free electrons and energy bands. The stated focus is planned to be delivered during lectures. A problem-based assignment is designed to encourage the learners to incorporate the ethics and professional



values. Learners need to sit for two tests, final semester examinations, and four quizzes to ensure sufficient theoretical and fundamental knowledge. Learners should be able to (i) develop new ideas and identify alternative approaches for problem solving related to solid state physics, and (ii) demonstrate the ethical values and professionalism character in completing a given task; upon completion of the course.

### Course Outcome

By the end of semester, students should be able to:

CO1: Solve related problems on industrially relevant crystals such as semiconductors, superconductors, dielectrics, and ferroelectrics

CO2: Use the learnt properties of crystalline solids to analyze related phenomena thereby solving related problems

CO3: Develop new ideas and identify alternative approaches for problem solving appropriate to electrical properties of crystalline solids.

CO4: Identify the ability to incorporate managerial skills in assigned task

CO5: Demonstrate leadership characteristics in assigned task

## CURRICULUM STRUCTURE BACHELOR OF OCCUPATIONAL SAFETY AND HEALTH WITH HONOURS

YEAR	FIRST SECOND				THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
COURSES	UHS1022 Soft-skill	UHL2412 English for academic communications	UGE2002 Technopreneurship	UHF2**1 Foreign language 2	UHL2432 English for professional communications	BPS3143 Behaviour Based Safety	BPS4113 OSH management system	BPS4812 industrial training
	UHC1012 Falsatah dan isu semasa	UHF**1 Foreign language 1	UHL2422 English for technical communications	BPS2233 Industrial Toxicology	BUM2413 Applied statistics	BPS3312 Final year project 1	BPS4324 Final year project 2	
	UQB1**1 Co-curriculum 1	UQB**1 Co-curriculum 2	BPS2213 Industrial hygiene	BPS2243 Exposure measurement technique & analysis	BPS3213 Occupational Epidemiology	BPS3153 Process safety & loss prevention.	Elective 4	
	BUM1113 Technical Mathematics	UHC2022 Penghayatan etika dan peradaban	BPS2113 Fire and Building Safety	BPS2133 Emergency preparedness & response planning	BPS3313 Accident & incident investigation analysis	Elective 1	Elective 5	
	BPS1112 Introduction to OSH	BPS1223 Industrial psychology	BPS2223 Ergonomics and Human Factor	BPS2143 Industrial Safety	BPS3123 Management Information System	Elective 2		
BPS1212 Introduction to Human Anatomy and Physiology	BPS1153 Engineering sciences	BPS2123 Occupational Safety, Health and Environment Legislations	BPS2153 Quality Management System	BPS3133 Construction Safety	Elective 3	Elective 5		
BPS1123 Analytical Chemistry	BPS1232 Introduction to Microbiology	BPS1143 Hazard Recognition and Risk Management	BPS2163 Ethics and Leadership in Safety					
BPS1133 Analytical Instrumentation								
TOTAL CREDIT PER SEMESTER	18	17	16	19	17	14	13	12
TOTAL CREDIT FOR GRADUATION	129							

## ELECTIVE COURSES FOR BACHELOR OF OCCUPATIONAL SAFETY AND HEALTH WITH HONOURS

NO.	CODE	COURSE	CREDIT HOUR
1	BPS3683	Environmental Management and Sustainability	3
2	BPS3613	Business Continuity Planning	3
3	BPS3643	Air Pollution Control Technology	3
4	BPS3633	Wastewater Treatment	3
5	BPS3652	Offshore and Marine Safety	3
6	BPS3663	Radiation Safety	3
7	BPS3673	Transportation Safety	3
8	BPS3623	Hazardous Waste Management	3
Total minimum credits of elective courses for graduation *Students are compulsory to take FIVE (5) elective course during the study			15

### PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1	Knowledge: Employable graduates with the knowledge and competency in Occupational Safety and Health
PEO2	Ethics & Professionalism: Graduates having professional attitude in fulfilling their role in Occupational Safety and Health
PEO3	Life Long Learning: Graduates engage in lifelong learning activity in their organization

### PROGRAMME OUTCOMES (PO)

PO1	Describe, interpret and apply knowledge of science and engineering in occupational safety and health
PO2	Assess and analyze issues of occupational safety and health in workplace and community
PO3	Interpret, analyze, synthesis and recommend preventive and corrective measures in occupational safety and health
PO4	Interpret, analyze, synthesis and recommend preventive and corrective measures in occupational safety and health
PO5	Apply evidence based scientific principles in discussing ideas of improvement in occupational safety and health
PO6	Educate and train employees, employers and the community on occupational safety and health
PO7	Demonstrate sensitivities and responsibilities towards the community, culture, religion and environment
PO8	Adhere to the legal, ethical principles and the professional code of conduct in occupational safety and health
PO9	Communicate in verbal and written forms with workers, other safety and health professionals, stakeholders and the community at large
PO10	Demonstrate leadership, interpersonal and social skills
PO11	Collaborate with other skills professionals
PO12	Conduct research related to occupational safety and health under supervision
PO13	Utilize ICT and information management system to enhance their occupational safety and health practices
PO14	Apply skills and principles of lifelong learning in career development
PO15	Apply broad business and real-world perspectives in workplace and demonstrate entrepreneurial skills

**COURSE SYNOPSIS****COURSE SYNOPSIS FOR BACHELOR OF OCCUPATIONAL SAFETY AND HEALTH WITH HONOURS****FUNDAMENTAL MODULES**

BUM 1113  
 Technical Mathematics  
 Credit Hour: 3  
 Prerequisite: None

**Synopsis**

This course introduces Polar Coordinates and Vector, Vector-Valued Functions, Partial Derivatives, and Multiple Integrals. Appropriate software is used by students to implement some of these ideas in practice.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Analyse and apply appropriate calculus concepts to solve various science and engineering problems.

CO2: Use appropriate software and tool to solve the graphical and computational problems in calculus.

CO3: Analyse and think critically a wide range of problem and solve it using ideas and methods in calculus.

CO4: Relate and applied the concepts and methods studied into other courses.

BUM 2413  
 Applied Statistics  
 Credit Hour: 3  
 Prerequisite: None

**Synopsis**

This course discusses on statistical problem-solving methodology and descriptive statistics; sampling distribution and confidence interval; hypothesis testing; analysis of variance (ANOVA); goodness-of-fit test and contingency tables; regression and correlation including simple and multiple linear regressions. Statistical packages such as Microsoft Excel, SPSS, R Language, S Plus,

EViews and Minitab shall be used in this course.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Explain statistical terminologies and apply statistical concepts in solving problems using conventional method.

CO2: Apply statistical concepts in solving problems using statistical packages.

CO3: Work together in a group to accomplish the task given.

BPS 1223  
 Industrial Psychology  
 Credit Hour: 3  
 Prerequisite: None

**Synopsis**

The Industrial Psychology course introduces students to the principles of behaviours as it exists at the workplace: attitudes of employees and employers, organizational behaviour, workplace environment and its effects. It focuses on three parts concerning personnel issues, organizational issues, and work environment issues investigated in industrial/organizational psychology. Specifically, the course explains the major applications of Industrial Psychology; describes the importance relationship of selecting, training, and evaluating employees; discusses the issues facing industrial psychology today and how these issues affect workers, organizations, and society; and illustrates how the principles of Industrial Psychology can be applied to day-to-day experiences as an organizational member, and to help you develop as an effective organizational member or manager.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Know major applications of Industrial Psychology.

CO2: Describe the importance relationship of selecting, training and evaluating employees.

CO3: Relate the issues affecting workers, organizations, and society.

CO4: Illustrate how the principles of Industrial Psychology can be applied in organization.

**BPS 1153**

Engineering Sciences

Credit: 3 credits

Prerequisites: None

### Synopsis

This course is designed to introduce students to the engineering and spatial science professions, to provide them with an understanding of the fundamental concepts of engineering science and to develop the basic skills necessary to effectively study in an engineering or spatial science discipline. Students will learn how to apply these skills and knowledge, using an engineering systems approach, to a range of authentic multidisciplinary engineering and spatial science problems. Topics covered include the nature of engineering and spatial science; fundamentals of engineering science and their application; study skills and an exposure to a range of professional skills including technical communications, calculation and presentation tools and information literacy.

### Course Outcome

By the end of semester, students should be able to:

CO1: Understanding fundamental scientific and applied mathematical principles in engineering applications.

CO2: Apply fundamental knowledge of engineering.

CO3: Formulate the method to solve introductory engineering problem

**BPS 1212**

Introduction to Human Anatomy and Physiology

Credit: 2 credits

Prerequisites: None

### Synopsis

This course aim is to provide an understanding of the structure (anatomy) and function (physiology) of the human body. Students will be introduced to the sciences of anatomy and physiology, anatomical organization and terminology and the hierarchical level of human body starting from cells, tissues, organs and systems.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain the fundamentals and basic unit of human body and physiology.

CO2: Recognise the anatomical structures and explain the physiological functions of body systems.

CO3: Communicate effectively in written and oral forms by completing tasks individually and in a team.

**BPS 1232**

Introduction to Microbiology

Credit: 2 credits

Prerequisites: None

### Synopsis

This course aim is to provide an understanding of microorganism that affect every aspect of life on earth. Some microbes cause disease but the majority are completely harmless. The existence if biological hazards in workplace settings usually underestimated. Thus, by learning the types of microorganisms and how it works can give the idea on the control of this biological hazards in systematic ways which can keep the workers exposed safety and healthy..

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain within multiple microbiology disciplines the core theories and practices.

CO2: Differentiate the functional anatomy and classification of microorganisms.

CO3: Explain the processes used by microorganisms for their replication, survival and interaction with their environment, hosts and host populations and its control

mechanisms.

CO4: Discuss and present the modern application of microbiology in industrial setting.

BPS 1133

Analytical Instrumentation

Credit: 3 credits

Prerequisites: None

### Synopsis

This course introduces students to the importance of analytical instrumentations analysis techniques are used to determine chemical compounds in environment such as air, water, sediment, and soil. Students will be taught on preparation of chemicals & instruments to conduct the analyses. Analytical errors including those arising from impurity of chemicals, instruments & methods used will also be discussed. Students will learn concept of chromatography, spectroscopy, and new approach on analytical instrumentations. Students will also be exposed to specific instruments including GC, HPLC, AAS, UV, ICP etc., to analyse specific or basic components in environmental analysis.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain basic concept of analytical instrumentation for environmental purpose.

CO2: Seek information on the contemporary analytical instrumentation and technology independently.

CO3: Propose extraction, analysis, procedure, and application of analytical instrumentation.

BPS 1123

Analytical Chemistry

Credit: 3 credits

Prerequisites: None

### Synopsis

The syllabus covers the basic knowledge and application of sample and data handling,

calibration techniques, data evaluation and quality of analysis in analytical laboratory. It also deals with separation techniques and its basis application such as GC and HPLC. The introduction to the theory, safety acknowledgement and application of spectroscopic techniques used in chemical analysis such as UV-Vis, FT-IR and AAS are discussed. The combinations of above techniques with their advantages are covered in this course.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain and describe the theory and application of analytical chemistry.

CO2: Interpret and analyse the analytical data.

CO3: Solve the problem related to analytical chemistry.

CO4: Explain the concept and application of analytical equipment such as GC, HPLC, UV-Vis., FT-IR, and AAS with regards to safety acknowledgement.

## PROFESSIONAL MODULES

BPS 3123

Management Information System

Credit Hour: 3

Prerequisite: None

### Synopsis

This course aims to provide firm understanding on the significance role of information systems in today's organization in particular in managing organizational most valuable assets - its data and information. The discussion sessions shall cover four major topics; Information Systems and its applicability in modern enterprise and organization including its strategic competitive advantage as well as ethical issues involved; Information technology infrastructure and security issues; Information system applicability for digital age; building and managing information systems for organizational use. Hands on activity on the usage of office automation system and designing relational database shall be cover in

lab sessions.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describe information systems roles in modern organization and its functions in obtaining organizational competitive advantage.

CO2: Describe information technology infrastructure and its requirement for digital firm and security threats involved.

CO3: Discuss various strategies and approaches in system development.

CO4: Demonstrate the usage of office automation system in performing operational tasks and managing information resources within organization.

#### BPS 2153

Quality Management System

Credit: 3 credits

Prerequisites: None

#### Synopsis

This course intends to provide an understanding of the fundamental of quality management. The topics covered the introduction to Quality Management, Quality's Guru, Quality Tools and Concepts, Different Quality Approaches, Quality Tools and Statistical Process Control. Students will be exposed to various cases studies on Quality locally and internationally.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Define and explain the fundamental concept and definition of total quality management.

CO2: Identify the basic knowledge on quality management and quality control in production and manufacturing.

CO3: Demonstrate and evaluate new concept of quality control for production and manufacturing, and quality practices in service sectors which integrate fundamental aspects of quality management.

#### BPS 1112

Introduction to Occupational Safety and Health

Credit: 2 credits

Prerequisites: None

#### Synopsis

This course introduces the principles and basic concepts of occupational safety and health. Students will be exposed to the history of occupational safety and health (OSH) development, acts and legislations in relation to OSH, the responsibilities and qualification of safety and health practitioner and professional ethics. The human bodies and its psychological functions and its relationship to workplace productivity will also be discussed. Introduction to Occupational Hygiene is also discussed as a foundation for the next subjects. Some common safety and health hazards will be emphasized for better understanding.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Apply the occupational safety and health fundamentals theory to identify hazards, risk and exposure at the workplace to improve safety and health performance.

CO2: Analyse workplace hazards, risk and exposure that effect workers health and planning for the best solution to improve workplace safety and health management and performance.

CO3: Discuss occupational safety and health problems/challenges and demonstrate a scientific approach to resolves the issues.

CO4: Adhere team working skills for problem solving in completing task.

#### BPS 2123

OSHE Legislation

Credit: 3 credits

Prerequisites: None

#### Synopsis

This course provides a foundation for understanding the related law on Occupational Safety and Health (OSH)

including act, rules, regulations, orders, guidelines and code of practice in their organization. The focuses of studies are for the students to know about the related law and apply their knowledge as OSH personnel in their organization in order to minimize hazards and accident.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain occupational safety and health related laws including act, regulations and code of practice to be applied at the workplace.

CO2: Apply related laws on occupational safety and health including act, regulations and orders to solve OSH related problems at the workplace.

CO3: Assist the organization to reduce accident and incident in the workplace by applying the related law.

BPS 2113  
Fire and Building Safety  
Credit: 3 credits  
Prerequisites: None

#### Synopsis

This subject is aimed to give an understanding on the basic concept of Fire Prevention and Protection especially its application in buildings. The course will cover topics such as Basic Principles of Fire and its category, the Components of Fire Safety, the Active and Passive Fire Safety Systems, the Life Cycles of a Building, Loss Impact and Means of Escape During Emergencies. Upon completion of this course, the students will be able to understand and practice major areas in fire hazard management and apply best practices in fire safety and fire management system as well as preparing for emergency cases. Students will also learn the theory of combustion and causes of fire and the way to fight fire, including the types and correct use of fire extinguishers. Students will experience with Live Fire Training Unit where they will learn how to use fire extinguishers correctly and safely.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Identify the basic principles of fire, fire sources and fuel classifications.

CO2: Distinguish between preventive and protective measures of fire safety in the buildings.

CO3: Analyse the loss impact of fire to individual, organization, society and the country.

CO4: Organize fire safety management system and establish the fire safety activity within the life cycle of a building.

BPS 1143  
Hazard Recognition and Risk Management  
Credit: 3 credits  
Pre-requisites: BPS1112 Introduction to Occupational Safety and Health

#### Synopsis

This course is aimed to give an understanding on the basic steps in recognizing hazards at work place and managing risks to as low as reasonably practicable (ALARP). These include the introduction to type of hazards, hazard identification, risk evaluation, risk assessment, determining risk control, hierarchy of risk control and risk management principle.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Conduct hazard identification and risk assessment in workplace.

CO2: Determine risk control and risk reduction measures based on hierarchy of control.

CO3: Adapt risk management principles in reducing risk level to as low as reasonably practicable (ALARP) and preventing workplace incidents.

BPS 2233  
Industrial Toxicology  
Credit: 3 credits  
Prerequisites: BPS1112 Introduction to



## Occupational Safety and Health

### Synopsis

This course provides students with a basic understanding and appreciation of the principles of human body system and toxic effects of chemicals on the living organism, regulatory aspect, application of toxicology in industry and the effects of toxic substances on man and the environment. Topics include: disposition and metabolism of toxic substances, types of exposure and response, toxic responses of selected body systems, toxic mechanisms of drugs, industrial chemicals, food additives, pesticides, environmental pollutants, household products, toxicity testing and risk assessment.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain the principles of human body system, dose-response relationship and the concept of threshold dose.

CO2: Explain how toxins enter the body and are transported to different organs and tissues.

CO3: List and discuss several types of toxic chemicals available in the occupational environment.

CO4: Describe organ toxicity and type of response occur which results from industrial chemical exposure.

CO5: Apply the principles of chemical safety management in the workplace.

### BPS 2213

Industrial Hygiene

Credit: 3 credits

Prerequisites: BPS1112 Introduction to Occupational Safety and Health

### Synopsis

This course generally will introduce the field of industrial hygiene, including the chemical, physical and biological agents, which affect the health and safety of employees, the application of control measures for the various agents and study of occupational exposure

limit. Upon completion of this course, the student will have studied the major topic areas within the field of chemical, physical and biological hazards, principle of exposure monitoring, medical surveillance and personal protective equipment.

### Course Outcome

By the end of semester, students should be able to:

CO1: Apply basic terms, technical concepts, legal, professional and ethical frameworks integral to the practice of industrial hygiene.

CO2: Conduct industrial hygiene assessment fieldwork using standard methodology, proper equipment and correct analysis.

CO3: Illustrate concept of anticipation, recognition and evaluation in designing hazard control to solve industrial problem.

### BPS 3143

Behaviour Based Safety

Credit: 3 credits

Prerequisites: NONE

### Synopsis

Work always involves humans. Human are complex and their behaviour is the results of interaction between and within internal and external factors. This course will introduce usage of behaviour-based safety as a scientific tool for behaviour change. The course will review the relationship between behaviour, attitudes, culture, and systems and explain how behaviour-based fits into the hierarchy of control. Underlying concepts related to performance management and a powerful tool (ABC analysis) is learned and applied to understanding behaviour and to developing a change plan. Overall, the course provides a clear understanding of how attitudes, cultures, and systems influence or affect behaviour, and focuses on understanding how successful behavioural change efforts really work. Effective leadership and involvement are seen as the cornerstone to success in promoting a positive safety culture. This course also will introduce current thinking on safety leadership and supervision models and strategies relevant to

health and safety at work.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Use the right technique in determining the best intervention strategy in promoting safety culture in a workplace.

CO2: Analyse the right concepts of behaviour-based safety approach in developing a Total Safety Culture in the workplace.

CO3: Demonstrate their ability to work in group either as a member or leader in completion of project related to behaviour-based safety.

#### BPS3213

Occupational Epidemiology

Credit: 3 credits

Prerequisites: BPS2233 Industrial Toxicology, BUM 2413 Applied Statistics

#### Synopsis

This course will emphasize on aspects of disease transmission and causation, measuring occurrence of disease, determining the cause of disease and estimating risk. The major types of epidemiologic study (cohort, case referent and cross-sectional) will be described. Threats to validity and issues in interpreting epidemiologic data such as bias, confounding factors, and random error will be discussed. Communicable and non-communicable diseases plus epidemiologic surveillance will be also discussed for preventing and controlling diseases. Students will also be exposed to the latest journals related to environmental and occupational epidemiology.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Demonstrate knowledge of the principle of disease causation, and the epidemiological approach to defining and measuring the occurrence of health-related states in populations.

CO2: Contrast the main types of study design in terms of characteristics, strengths, weaknesses and risk measurements.

CO3: Apply the epidemiology concepts and methods to broad area of environmental and occupational health.

#### BPS 2133

Emergency Preparedness & Response Planning

Credit: 3 credits

Prerequisites: NONE

#### Synopsis

This course will provide student with basic understanding of Emergency and Disaster Management based on its cycle. Managing a good emergency response is the most effective way to reduce the impact of a crisis on vulnerable populations. Student also will be exposed to management processes which involve units created to prepare for, respond to and recover from any emergency events. This is important to ensure the business continuity is achieved after facing certain type of disasters by manmade or natural cause. Specific topics on Business Continuity Management (BCM), Hazardous Materials (HAZMAT), Incident Command System (ICS) and *Arahan Nombor 20 Majlis Keselamatan Negara* (MKN) also will be discussed.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Apply the knowledge of emergency response preparedness for emergency and Disaster Management plan.

CO2: Evaluate vulnerability analysis in determining exposure of human, environment and property to various emergency threats.

CO3: Apply appropriate technical skills in conducting Emergency response and preparedness plan.

#### BPS 2223

Ergonomics and Human Factor

Credit: 3 credits

Prerequisites: BPS1112 Introduction to OSH

## Synopsis

This course provides a foundation for understanding the key concepts and principles related to ergonomics. The aim of ergonomics in industry is to increase productivity, and decrease accidents and illnesses by obtaining a good fit between the employer and the job. This course also examines the relationships between employer, work equipment and work environment. Case studies are also used to test student current knowledge and understanding of the way complex systems are designed and used.

## Course Outcome

By the end of semester, students should be able to:

CO1: To apply scientific knowledge of ergonomics in order to identify ergonomics related problems.

CO2: To analyse and interpret the level ergonomics risk factors that may exist in the place of work.

CO3: To propose control measure to overcome ergonomics problems.

## BPS 2243

Exposure Measurement Technique and Analysis

Credit: 3 credits

Prerequisites: BPS 2213 Industrial Hygiene

## Synopsis

This course is for advanced in-depth study of the approaches to workplace and personnel exposure sampling. Emphasis is on statistical sampling methods, passive monitoring, colorimetric devices, breathing zone, area sampling strategies, monitoring and surveillance techniques. Course work will include laboratory exercises and field work. This course is also designed to assist student in understanding the various instruments that are utilized in industrial hygiene and environmental studies and give them the chance to fully understand the way these instruments are calibrated and applied.

## Course Outcome

By the end of semester, students should be able to:

CO1: Prepare occupational and environmental stressor assessment report cases to comply with relevant legislations.

CO2: Differentiate appropriate sampling procedure and measuring technique for occupational and environmental stressors.

CO3: Adapt data collection and analysis through surveys, calibration, sampling, monitoring by using the instantaneous or integrated instruments to assess the risk of occupational and environmental stressors.

## BPS2143

Industrial Safety

Credit: 3 credits

Prerequisites: BPS1112 Introduction to OSH

## Synopsis

This course designed to give student understanding in industrial safety field and its application in the hazard's identification and risk management. Students will be exposed to machinery safety practices including design, safe operation, fencing and guarding. Student also will be introduced to mechanical handling safety which details out the design and safe operation of material handling equipment. Maintenance hazards are discussed in details including hazardous energy control and permit-to-work (PTW) system. Hazards of confined space and pressure vessel are also exposed to student. Basic electrical and radiation safety topics are discussed as part of industrial safety management.

## Course Outcome

By the end of semester, students should be able to:

CO1: Conduct recognition of physical hazards in workplace.

CO2: Analyse any issue and incident on physical hazards to solve industrial safety problems.

CO3: Adapt industrial safety management best practices in workplace.

## BPS3113

**Accident Investigation and Analysis**

Credit: 3 credits

Prerequisites: BPS1112 Introduction to OSH

**Synopsis**

This subject is aimed to introduce and give an understanding on the methodology for incident investigation and analysis. Topics include data collection, investigation techniques, interviewing techniques, notification and reporting to authority, corrective and preventive actions to prevent recurrences. Root cause analysis techniques commonly used in the industry will be also introduced.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Conduct incident investigation at workplace.

CO2: Carry out root cause analysis (RCA) to determine incident causal factors.

CO3: Initiate incident notification and reporting to authorities based on legislations, track and close out correction and preventive actions.

**BPS3312**

Final Year Project 1

Credit: 2 credits

Prerequisites: All the first and second year subjects

**Synopsis**

This course will expose the students on the process of conducting academic research in order to provide the skills and ability in carrying out research project in the area of their study. The covered areas for Final Year Project 1 are: (i) problem background, (ii) problem statement, (iii) research objectives, (iv) research questions, (v) research framework, (vi) literature reviews, and (vii) research methods.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Identify problems/issues/incidences, research objectives/ questions, appropriate literature and research methods.

CO2: Relate problems/issues/incidences with research objectives, research questions and literatures.

CO3: Prepare research proposal comprising research problem, Ros, RQs, literature review and research methods.

**BPS4324**

Final Year Project II

Credit: 4 credits

Prerequisites: BPS3312 Final Year Project I

**Synopsis**

This course will expose the students on the process of conducting academic research in order to provide the skills and ability in carrying out research project in the area of their study. The covered areas for Final Year Project II are: (i) development of research instruments for data collection, (ii) carrying out data collection, (iii) analysing data collected, (iv) interpreting data, (v) writing reports.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Develop research instruments.

CO2: Analyse collected data using research instruments that has been developed.

CO3: Prepare Final Year Project report comprising research problem, Ros, RQs, literature review, research methods, data analysis and conclusions.

**BPS 3153**

Process Safety and Loss Prevention

Credit: 3 credits

Prerequisites: BPS 1143 Hazard Recognition and Risk Management

**Synopsis**

This course presents the principles and methodology for Process Safety Management (PSM) in chemical and process-based industries. In particular, it emphasizes on Process Hazard Analysis (PHA). The

implementation of PSM also will be explained to students. Loss prevention systems such as relief system, emergency shutdown system, toxic release suppression, explosion prevention and safety instrumented system will also be discussed. Students also will be trained on major hazard management based on major accident case studies.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Conduct Process Hazard Analysis (PHA) to determine process hazards.

CO2: Apply process loss prevention systems to reduce process risks.

CO3: Adapt Process Safety Management (PSM) and major hazard management as part of industrial disaster risk reduction.

#### BPS4113

OSH Management System

Credit: 3 credits

Prerequisites: BPS1112 Introduction to OSH

#### Synopsis

This course will expose the candidates to the latest and existing Occupational Safety and Health Management System (OSH-MS), the evolution and the elements in the systems that cater current requirement in OSH. The course also introduces the concepts, relationships and principles of managing the OSH function and the development of training procedures and practices to integrate that function into the organization.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Apply the PDCA cycle and OSH-MS models based on recognized standards.

CO2: Analyse all phase in OSHMS; policy, hazard and risk analysis, compliance of legal and other requirements, objectives and programmes.

CO3: Communicate ideas professionally in relation to Occupational Safety and Health Management System.

#### BPS 3133

Construction Safety

Credit: 3 credits

Prerequisites: NONE

#### Synopsis

This course is designed for persons who work in the construction industry. This course will provide all members with greater safety in construction field particularly referred to construction safety awareness. It is also designed to increase their confidence in the action to take in case of any emergencies. The stages of construction and most of the building process within the life cycle of a building will be elaborated. All the relevant document and acts particularly relating to Malaysia scenario are among the important references that will be discussed along with the sequence of building construction. Building materials Students are expected to venture into a general safe working practices at construction site and able to supervise the total environment as a free accident area.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Identify the hazardous materials, substances and unsafe practices at construction industry.

CO2: Assess the level of risk and safety of work places compliance to the national safety regulation.

CO3: Outline a proposal to enhance and increases a safer work practices in construction industries.

#### BPS 2163

Ethics and Leadership in Safety

Credit: 3 credits

Prerequisites: NONE

#### Synopsis

The purpose of this course is to examine the ethics and leadership in context of safety. In this course, student will examine the ethics of what safety professionals are, what they do, and how they do it. Student will examine

ethical issues related to safety leadership through case studies. The course looks at how safety leaders convey values through actions, language, and as role models. Since this is an applied course, students will discuss and analyse case studies where they will apply philosophic concepts of safety ethics to real problems and stories of real safety leaders..

#### Course Outcome

By the end of semester, students should be able to:

CO1: Apply knowledge in ethics and leadership in solving safety issues.

CO2: Discuss case studies in safety ethics issues and formulate the solution.

CO3: Discuss case studies in safety leadership issues and formulate the solution.

#### ELECTIVE MODULES

##### BPS 3623

Hazardous Waste Management

Credit: 3 credits

Prerequisites: NONE

#### Synopsis

This course introduces the students to elements of solid waste management systems, which include generation, on-site handling, collection, transportation, treatment and disposal. Aspects to be discussed include methods of waste classification, categorization and listing, handling of waste at source, collection and transportation of waste, waste treatment technologies including waste minimization and recycling, and final disposal technologies. Current and legal issues on solid waste management both from local and international perspectives will also be discussed.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain elements in solid waste management and characteristics of solid waste.

CO2: Propose suitable technology of managing the solid waste that are available within the national and international practices.

CO3: Demonstrate their ability to work in team either as leader or ordinary member.

##### BPS3643

Air Pollution Control Technology

Credit: 3 credits

Prerequisites: None

#### Synopsis

The topics in this course discuss several important aspects of air pollution that include classification and sources of air pollutants, their effects on human, vegetation and material. Sampling methods, pollution control and air quality management system will be discussed.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Understand the terminologies, theories and principle of air pollution control technology.

CO2: Understand the impacts and the risks of air pollution towards human health and environment.

CO3: Understand the meteorological concept and its application in air pollution studies.

CO4: Identify the specific air pollutants and its control technology.

CO5: Apply proper air pollutants sampling methods for air quality monitoring.

##### BPS3613

Business Continuity Plan

Credit: 3 credits

Prerequisites: NONE

#### Synopsis

This course is an extension with details regarding to emergency preparedness and response where it provides a foundation and guide to coordinated organizational emergency recovery during and after a disruptive occurrence. The best practices for planning and maintaining Business Continuity Management (BCM) programs is introduced to students where knowledge of these

practices is essential to managers and planners of small companies, large corporations and public agencies in order to keep their organizations running after major disruptive events. The recovery time and recovery point objectives (RTO and RPO) also covered.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Conduct Business Continuity Management programme and exercise at workplace based on applicable standards.

CO2: Carry out Risk Analysis and Business Impact Analysis to determine business continuity strategies.

CO3: Adapt industrial best practices of the Business Continuity Management as part of disaster risk reduction.

#### BPS 3683

Environmental Management and Sustainability

Credit: 3 credits

Prerequisites: NONE

#### Synopsis

This course will cover the fundamental of environmental management, the principles and concepts about ecology, ecosystems, weather and human impacts on the environment, and the concept of green technology. The natural renewable and non-renewable resources and its management, current issues related to the environment including economics, global view and ethics will also be discussed. Other issues related to environmental development, trade, green activities and roles that are played by the consumer, community, industry and government towards sustainable development also discovered. The students will be also introduced to the ISO 14000 series of Environmental Management Standards and environmental management tools which minimize and reduces the negative impact of human activities.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Apply theories and principles of environmental management and sustainable development in solving environmental issues.

CO2: Analyse current environmental problems and able to select international conventions, agreements and local legislations to come out with idea on how to solves the problems.

CO3: Recognize appropriate solution for current environmental issues by integrating environmental management tools and systems, and green technology applications towards sustainable development.

#### BPS 3652

Offshore and Marine Safety

Credit: 3 credits

Prerequisites: NONE

#### Synopsis

This course introduces student to Health, Safety and Environment (HSE) principles and practices in marine and offshore operations particularly in oil and gas industry. Marine and offshore safety covers upstream operations which include exploration, drilling, completion, production and transportation. The lifecycle of this industry will be covered from engineering, procurement, construction, hook-up, installation, commissioning, operation, maintenance and decommissioning. Topics include legal requirements, type of hazards, accident cases, safety management and technical aspects. Discussion personnel safety and process safety issues will be emphasized. Safety Analysis tool such as Hazard Identification (HAZID) Analysis and Bow Tie Analysis will be introduced. Applicable international standards and codes such as International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), Safety International Convention for the Safety of Life at Sea (SOLAS), 1974 and International Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM) and International Ship and Port Facility Security Code (ISPS) will be exposed to students.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain concept of hazard, risk and safety applied in marine and offshore operations.

CO2: Analyse marine and offshore hazards using modern tools and data analysis methods.

CO3: Adapt best practices in implementing safety management systems for marine and offshore industrial sector.

#### BPS 3673

Transportation Safety

Credit: 3 credits

Prerequisites: NONE

#### Synopsis

This course introduces student to Health, Safety and Environment (HSE) principles and practices in land transportation and aviation sectors. Land transportation sectors cover road and railway while for aviation cover flight and ground airside safety. Topics include regulatory requirements, type of hazards, accident cases, technical aspects and Safety Management System (SMS). The discussion on personnel and technical safety issues will be emphasized. Safety Analysis tool such as Fault Tree Analysis (FTA) and Failure Mode and Effect (FMEA) Analysis will be introduced. Applicable international standards from such as Federal Railway Administration (FRA), National Transportation Safety Board (NTSB) and International Civil Aviation Organization (ICAO) will be exposed to students.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Explain concept of hazard, risk and safety applied in land transportation and aviation operations.

CO2: Analyse land transportations and aviation hazards using modern tools and data analysis methods.

CO3: Adapt best practices in implementing safety management systems for land transportation and aviation sector.

#### BPS 3663

Radiation Safety

Credit: credits

Prerequisites: NONE

#### Synopsis

This introductory course in the fundamentals of radiation and nuclear safety intended to meet the requirements required of all employees who receive, or might receive, a health care related occupational exposure while working in or near a controlled / restricted area. The course focuses on the need for every employee, both radiological workers and non- radiological workers, to play an active role in maintaining exposures to radiation and radioactive materials within regulatory limits and in compliance with regulatory control such as The International Basic Safety Standards for Protection Against Ionizing Radiation and for Safety of Radiation (BS), IAEA Safety Series no 115 (1996), Atomic Energy Licensing Act 1984 (Act 304). Topics include Fundamentals of Radiation and Radioactivity, Radiation Biology, Radiation Dose Limits and ALARA, Personnel Monitoring and others

#### Course Outcome

By the end of semester, students should be able to:

CO1: Interpret the fundamental of radiation and nuclear safety in the workplace

CO2: Classify risks associated with radiation, radioactivity and radiation exposure among workers exposed to radiation.

CO3: Adapt the best practices to meet desired safety and health for workers exposed to radiation within the considerable of economic, social, political and sustainability.

#### BPS 3633

Wastewater Treatment

Credit: 3 credits

Prerequisites: NONE

#### Synopsis

This course gives the students exposure to the physical, biological and chemical processes



that are used in the treatment of wastewater. Examples of the use of these processes in the manufacturing sector and agriculture including low waste zero discharged technology will be discussed. The environmental laboratory is introduced to students the important of scientific analysis of the wastewater as part of environmental impact assessment. This is to curb the damaged done to the purity of water and to be able to reduce the level of pollution into the surrounding living space particularly involving the quality of river.

#### Course Outcome

By the end of semester, students should be able to:

CO1: To apply scientific knowledge of the wastewater treatment technology in order to control level of pollution in the environmental.

CO2: To analyse and interpret the level of pollution that exists within the specify sample of wastewater analytically.

CO3: To communicate the importance of wastewater treatment technology theoretically and analytically with the safety, health and environmental issue.

#### INDUSTRIAL TRAINING

BPS 4812

Industrial Training

Credit: 12 credits

Prerequisites: All subjects

#### Synopsis

This course aims to give chances for the student to practice and apply their knowledge and skills that they gain during their study. During the placement, we expect students to keep a log book, in which they make a regular entry describing the work they are undertaking. Student are supervised by industrial and university supervisors to guide and ensure they can do their work as good as possible and achieve the objective for this course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Adapt working culture and regulation as occupational safety and health practitioner in related industry.

CO2: Demonstrate skills by applying the theory learned for real problem solving in organization.

CO3: Support others in organization performing the task given.

CO4: Express interpersonal skills and professional ethics in organization.

CO5: Perform assigned task proficiently as required by industrial training supervisor.

CO3: Support others in organization performing the task given

CO4: Express team working skills and professional ethics in organization

CO5: Perform assigned task proficiently as required by industrial training supervisor.

**CURRICULUM STRUCTURE  
DIPLOMA IN INDUSTRIAL SCIENCES**

YEAR	SECOND					
	FIRST	SECOND	THIRD	FOURTH	FIFTH	
SEMESTER 0	FIRST	SECOND	THIRD	FOURTH	FIFTH	
COURSES	Entrepreneurship UGE1002	UHC1012 Falsafah dan Isu Semasa	UHC2022 Etika dan Peradaban	UHS1022 Soft Skills	DRS2763 Laboratory Quality Management & Validation	UQA1002 Co-Curriculum
		DUM1123 Calculus	DUM2423 Statistics	DUM1413 Introduction to Data Science	DRS2772 Current issues in Science	DRS2772 Industrial Training
		UHL2442 Essential English	UHL2412 English for Academic Communication	UHL2432 English for Professional Communication	DRS2782 Industrial Quality Management	
	Basic Mathematics DUM1113	DRS1713 Industrial and Laboratory Safety	DRS1743 Organic Chemistry	DRS1733 Computer Interfacing & Control	DRS2153 Inorganic Chemistry	
		DRS1713 Industrial and Laboratory Safety	DRS1822 Organic Chemistry Lab	DRS2132 Instrumental Analysis	DRS2242 Inorganic Chemistry Lab	
		DRS1723 Chemistry	DRS1123 Analytical Chemistry	DRS2143 Physical Chemistry	DRS2162 Environmental & Water Technology	
	Application for Industry DRS1102	DRS1812 Chemistry Lab	DRS1222 Analytical Chemistry Lab	DRS2232 Physical Chemistry Lab	DRS2553 Polymers	
		DRS1113 Physics	DRS1513 Material Science	DRS2523 Metals and Alloys	DRS2543 Composites	
		DRS1212 Physics Lab	DRS1612 Material Science Lab	DRS2553 Ceramics	DRS2622 Polymers & composites Lab	
		DRS1113 Physics	DRS13323 Cell & Molecular Biology		DRS2353 Bioprocess Technology	
		DRS1212 Physics Lab	DRS1422 Cell & Molecular Biology Lab		DRS2442 Bioprocess Technology Lab	
		DRS1313 Biochemistry	DRS1412 Biochemistry Lab	DRS2332 Food Biotechnology	DRS2362 Bioinformatics	
	DPQ1113 Principles of Operation Management					
	TOTAL CREDIT PER SEMESTER	10	20	17	17	14
	TOTAL CREDIT FOR GRADUATION	90				

## DIPLOMA IN INDUSTRIAL SCIENCES

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	Cognitive To gain and apply knowledge in the field of industrial science
PEO2	Psychomotor To possess practical and communication skills in the working environment
PEO3	Affective To become a holistic person with professionalism, ethical and high integrity

PROGRAMME OUTCOMES (PO)	
PO1	Demonstrate knowledge and understanding of the theory and principles of the field-of-study on well-defined procedures and practices.
PO2	Apply appropriate techniques, skills and tools in the practices of studied field to resolve well-defined problems.
PO3	Identify well-defined problems and produce innovative solutions that comply with principles of the field-of-study
PO4	Communicate effectively within a wide range of audiences including social, academic and professional through oral, visual and written skills purposes.
PO5	Demonstrate social skills and responsibilities in recognition and acceptance of individual, society and cultural diversity to the extended well-defined technology practices.
PO6	Research, explore, learn and use new technology to acknowledge the requirement of career establishment and to employ independent continuing learning in specialized technical knowledge.
PO7	Apply consciousness of management and technopreneurship routine in real perspective
PO8	Demonstrate behaviours that are consistent with professional standards and ethical responsibilities.
PO9	Function effectively as a team member with leadership character in diverse technical teams.

## **COURSE SYNOPSIS FOR DIPLOMA IN INDUSTRIAL SCIENCES**

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### **DUM1113 Basic Mathematics**

**Credit Hour: 3**

**Prerequisite: None**

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#### **Synopsis**

This course introduces and discusses the fundamental of mathematics focusing on providing a solid theoretical foundation for further work. Students will be exposed to number system, equations, inequalities and absolute value, polynomials, sequences and series, matrices and system of linear equations, functions and graphs, and trigonometric functions. This course also integrates symbolic tools, graphical concepts, and numerical calculations.

#### **Course Outcome**

By the end of semester, students should be able to:

CO1: Acquire the fundamental principles of basic mathematics.

CO2: Apply appropriate method studied to solve mathematical problems.

### **DUM1123 Calculus**

**Credit Hour: 3**

**Prerequisite: None**

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#### **Synopsis**

Calculus is the mathematics of change, of calculating problems that are continually evolving; by breaking such problems into infinitesimal steps, solving each of those steps, and adding all the results. Calculus allows these computations to be done simultaneously. There are two primary branches of calculus i.e., differential calculus (differentiation) and integral calculus (integration). Therefore, students will be exposed to limits and continuity, differentiation, application of differentiation, integration, and

application of integration. This course integrates symbolic tools, graphical concepts and numerical calculations.

#### **Course Outcome**

By the end of semester, students should be able to:

CO1: Acquire and apply the fundamental principles of calculus.

CO2: Apply the appropriate method studied to solve mathematical problems.

CO3: Provide solution to solve mathematical problem arise from real life

### **DRS1713 Industrial and Laboratory Safety**

**Credit Hour: 3**

**Prerequisite: None**

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#### **Synopsis**

This course exposes students to basic concepts of industrial and laboratory safety. Topics inclusive of quality systems for laboratory management, occupational health & safety and acts, and related regulations. Students will be introduced to laboratory and industrial safety, laboratory and industrial accident, safety policy and procedure, emergency response plan, introduction to basic toxicology, and first aid.

#### **Course Outcome**

By the end of semester, students should be able to:

CO1: Explain the basic concept of industrial and laboratory safety.

CO2: Possess the knowledge and information related to quality system, policies, procedures and safety manuals.

CO3: Present and contribute to the needs of group work related to laboratory and industrial safety in assigned test.

**DRS1723 Chemistry****Credit Hour: 3****Prerequisite: None**

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**Synopsis**

This course emphasizes basic understanding of chemistry. Students will be introduced to theories and basic concepts of chemistry. The course explains the basic concepts of matter, unit conversion, atomic structure, the periodic table of elements, chemical bonding, state of matter, thermochemistry and equilibrium. In this section also, there are calculations of basic concepts in chemistry such as mole, concentration and balance equation. At the end of this course, students will master the theory, concepts and understandings of basic chemistry that can be apply for related courses.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Explain theories learned to solve problems of chemistry.  
 CO2: Solve related problems in chemistry using the appropriate principles.  
 CO3: Demonstrate a good ethics in completing the given task.

**DRS1812 Chemistry Laboratory****Credit Hour: 2****Prerequisite: None**

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**Synopsis**

This course offers a rigorous, foundational treatment of atoms and molecules. The students will study the nature of chemical bonding and how bonding gives rise to the three-dimensional structure of matter. We explore how the macroscopic properties of substances can be interpreted in terms of atomic and molecular structure. We also learn mathematical and conceptual

tools for quantifying chemical equilibrium.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Solve related problems in material science and technology using the appropriate principles.  
 CO2: Follow the guided experiments using the correct guideline and procedures.  
 CO3: Work in teamwork, communicate effectively orally and in writing the information.

**DRS1733 Computer Interfacing & Control****Credit Hour: 2****Prerequisite: None**

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**Synopsis**

Internet of Things (IoT) consists of smart devices that communicate with each other. The IoT starts with measurement and being able to collect data from devices anywhere in the world, linked up via the Internet to 'big data' information systems and provides the foundation for control and optimization. Due to the importance of IoT, this course introduces basic concepts and techniques of computer interfacing with external devices for data collection and process control. This will include transferring and converting analog variables into the digital form needed for processing. The contents emphasis not only on the theoretical knowledge of interfacing but also the practical implementation in real-life situation. Students will learn basic structure of computer interfacing and exposed to method for basic hardware-software interfacing. It is aimed that students will be interested in data acquisition and real-time control systems and data logging system incorporating input/output to and from external devices.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Explain theories of interfacing concept, data acquisition and their practical applications.

CO2: Solve related problems to troubleshoot analog and digital interfacing circuits using the appropriate technique.

CO3: Apply digital skills to solve problems.

### **DUM2423 Statistics**

**Credit Hour: 3**

**Prerequisite: None**

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#### **Synopsis**

This course discusses on descriptive statistics; graphical summary; common probability distributions; statistical analysis for means; simple linear regression and correlation, and goodness of fit test and contingency tables. Microsoft Excel software will be used in this course as a statistical package (other statistical packages are SPSS, R Language, S Plus, EViews and Minitab shall be used in this course).

#### **Course Outcome**

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of statistics.

CO2: Perform statistical analysis by using appropriate statistical theory and methodology.

CO3: Analyse real life to solve related problem in various disciplines.

### **DRS1743 Organic Chemistry**

**Credit Hour: 3**

**Prerequisite: None**

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#### **Synopsis**

In this course, fundamental principles of organic chemistry will be introduced. Chemical structures, physical properties and chemical bonding of organic molecules and basic organic reaction to

prepare common functional groups will be studied.

#### **Course Outcome**

By the end of semester, students should be able to:

CO1: Understand the principle of chemical bonding and nomenclature which followed the IUPAC system.

CO2: Describe characteristics and physical properties of certain organic molecules.

CO3: Recognize the main functional groups in organic chemistry and predict their reactions.

### **DRS1822 Organic Chemistry Laboratory**

**Credit Hour: 2**

**Prerequisite: None**

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#### **Synopsis**

Practical activities which comprise several laboratory experiments related to organic chemistry; will be carried out by the students. In organic chemistry experiments, students are exposed to melting point determination, extraction, distillation, isolation, crystallization, chromatography, titration and identification of an organic functional groups.

#### **Course Outcome**

By the end of semester, students should be able to:

CO1: Apply the knowledge of organic chemistry to solve the problem.

CO2: Report and discuss the data and information of the experiment.

CO3: Communication by explain the questions given based on experiments.

### **DRS2763 Laboratory Quality Management & Validation**

**Credit Hour: 2**

**Prerequisite: None**

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**Synopsis**

This course introduces the Good Laboratory Practice (GLP) with many aspects of laboratory quality management and the way to achieve recognition and certification. In addition, different perspectives and theories of method validation including issues in validating, testing, research method and measurement of uncertainty will be addressed.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Explain concepts of laboratory quality management and its validation process.
- CO2: Solve related problems to laboratory quality management and its validation process.
- CO3: Present and contribute to the needs of group work related to laboratory quality management.

**DUM1413 Introduction to Data Science****Credit Hour: 3****Prerequisite: None**

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**Synopsis**

Data science is an emerging field of study and requires a powerful combination of various disciplines namely mathematics, statistics, computer science and domain expertise. This course presents the overview of data science including the definition and foundation of data science, the process of data science, its infrastructure, computing for data science and issues related to data science. Case studies are discussed to illustrate the data science application.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Explain the terminologies used in data science.

CO2: Distinguish the components and requirements of data science.

CO3: Communicate effectively in written and oral forms by completing the task given.

**DPQ1113 Principles of Operations Management****Credit Hour: 3****Prerequisite: None**

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**Synopsis**

The course provides a range of academic knowledge, operations understanding, operational management techniques. It will focus on the main decision areas of operations management and the role of the operations manager for productivity improvement.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Apply the fundamental concept and the main areas of operation management.

CO2: Demonstrate operation decisions in solving operational problems.

CO3: Justify operations management requirements.

**DRS1113 Physics****Credit Hour: 3****Prerequisite: None**

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**Synopsis**

This course is intended to expose the central ideas and principles of physics to students requiring a general background in physics. It covers unit and measurements, kinematics, forces and

Newton's law of motion, statics equilibrium, work, energy and power, fluid mechanics, electricity and magnetism.

### **Course Outcome**

By the end of semester, students should be able to:

CO1: Explain theories learned to solve problems of physics.

CO2: Solve related problems in physics using the appropriate principles.

CO3: Respond and contribute to the need of group work in assigned task.

### **DRS1212 Physics Laboratory**

**Credit Hour: 2**

**Prerequisite: None**

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#### **Synopsis**

Throughout this course, student will conduct and doing experiments which reflects to theoretical learned and actual practice in industry such as moments, Hooke's law, free fall, thermal expansion of solid and liquid etc. As such, it will provide an excellent foundation to fulfill the requirements of other material courses.

#### **Course Outcome**

By the end of semester, students should be able to:

CO1: Solve related problems in material science and technology using the appropriate principles.

CO2: Follow the guided experiments using the correct procedures.

CO3: Organize and complete with confidence the experiments using the correct procedures.

### **DRS1123 Analytical Chemistry**

**Credit Hour: 3**

**Prerequisite: None**

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#### **Synopsis**

This course will provide students with a basic understanding of analytical chemistry and major aspects of quantitative chemical analysis. The course will concentrate upon descriptive analytical chemistry and analytical methods based on chemical equilibrium.

### **Course Outcome**

By the end of semester, students should be able to:

CO1: Explain theories learned to solve problems of quantitative analysis.

CO2: Solve related problems in analytical chemistry using the appropriate principles.

CO3: Demonstrate teamwork skills in solving the assigned tasks.

### **DRS1222 Analytical Chemistry Laboratory**

**Credit Hour: 2**

**Prerequisite: None**

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#### **Synopsis**

Throughout this course, student will conduct experiments which reflects to theoretical learned and actual practice in industry such as titration, instrumentation analysis etc. As such, it will provide an excellent foundation to fulfill the requirements of industrial chemistry course.

#### **Course Outcome**

By the end of semester, students should be able to:

CO1: Solve related problems in analytical chemistry using the appropriate principles.

CO2: Follow the guided experiments using the correct procedures.

CO3: Demonstrate teamwork skills in solving the assigned tasks.

### **DRS1232 Instrumental Analysis**

**Credit Hour: 2**

**Prerequisite: None**

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**Synopsis**

This course is intended to expose the central ideas and principles of instrumental to students requiring a general background in chemistry. It covers the initial basics of data analysis, principles of mass, UV-Vis, infrared, atomic spectrometry and chromatography.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Explain theories learned to solve analytical problems in chemistry.  
 CO2: Solve related problems in analytical chemistry using the appropriate instrumental principles.  
 CO3: Demonstrate teamwork skills in solving the assigned tasks.

**DRS1313 Biochemistry****Credit Hour: 3****Prerequisite: None**

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**Synopsis**

Biochemistry is a field of study which related to macromolecules, and exploration of their physical and biochemical characteristics. Consequently, important pathways for the biosynthesis and degradation of the macromolecules will be explained. The coverage on metabolism also included energy production from most importantly of carbohydrate and lipid macromolecules. Besides that, the principle of cellular signaling in living organisms also will be described in this course. Overall fundamental biochemistry knowledge to be imparted for preparedness for higher cognitive courses of biotechnology.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Defining the structure,

properties and biochemical roles of macromolecules and their respective monomers.

CO2: Explain macromolecules biosynthesis and monomers degradation for energy production in metabolism.

CO3: Presenting the function and integration of various metabolic pathways in organism.

**DRS1412 Biochemistry Laboratory****Credit Hour: 2****Prerequisite: None**

---

**Synopsis**

This course provides hands-on training of laboratory apparatus and equipment such as pH-meter, magnetic stirrer, and spectrophotometer as well as the basic preparation of common reagents in the laboratory such as buffer preparation. The course will introduce students with the basic calculations and techniques that are commonly used in a biochemical lab. Several quantitative and qualitative tests on important biomolecules will also be covered.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Relate the fundamental theories with laboratory experiments.  
 CO2: Demonstrate skills in handling basic biochemistry-related equipment and performing biochemistry experiments.  
 CO3: Analyze, Interpret and relate experimental data with the fundamental theories.

**DRS1323 Cell & Molecular Biology****Credit Hour: 3****Prerequisite: None**

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**Synopsis**

This course discusses fundamental

concepts of cell biology, structure and function of cellular organelles and their biomolecules. Emphasis will be given on compositions, structures and functions of cell membrane and concepts of cell division. The course also includes discussions on applications of cell biology such as cancer, antibodies and stem cells. Concepts of molecular biology, gene expressions and its control are also discussed. Brief introductions on techniques of molecular biology such as DNA/RNA extraction, polymerase chain reaction (PCR), and gene cloning also explained in this course.

### Course Outcome

By the end of semester, students should be able to:

CO1: Understand and describe the principle

of cell and molecular biology.

CO2: Analyze cell structures, biological mechanisms and their related investigation techniques.

CO3: Relate cell and molecular biology knowledge with current and ethical issues.

### DRS1422 Cell & Molecular Biology Laboratory

**Credit Hour: 2**

**Prerequisite: None**

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### Synopsis

In this course, students will be introduced and practice modern biotechnology laboratory techniques and theories. The subjects that will be covered are basic laboratory equipments' handling and techniques such as nucleic acid isolation and purification, deoxyribonucleic acid (DNA) cloning, polymerase chain reaction (PCR) and gel electrophoresis analysis. In addition, students will be exposed to basic bioinformatic tools for analysis of genes.

### Course Outcome

By the end of semester, students should be able to:

CO1: Relate the fundamental theories with laboratory experiments.

CO2: Demonstrate skills in performing cell and molecular biology experiments.

CO3: Analyze, Interpret and relate experimental data with the fundamental theories.

### DRS2332 Food Biotechnology

**Credit Hour: 2**

**Prerequisite: None**

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### Synopsis

This course is aimed to produce graduates who are knowledgeable, skilled and able to integrate the knowledge of biological science, biotechnology and food technology related to considering ethical and legal aspects.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain the principles of food biotechnology.

CO2: Analyze the food biotechnology-based concept in order to develop problem-solving strategies and solutions.

CO3: Understand and be aware of ethical, legal and socio-cultural impacts on the application of food biotechnology in the industry.

### DRS1513 Material Science

**Credit Hour: 2**

**Prerequisite: None**

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### Synopsis

This course is designed to expose the concept of structure and scaling. There are seven (7) headlines in the course; atomic structure, bonds and crystal structure, defect structure and

strengthening mechanisms, failure, diffusion, material properties (mechanical, electrical, magnetic & optic), economic, and environmental issues. Student will be taught in lecture room; and the assessments which include quiz, test, assignment and final exam will be carried out throughout the semester. At the end of semester, students are expected should be able to explain, solve, analyze and develop new ideas during problem solving; related to material science. Furthermore, students also should be able to demonstrate good ethics and professional skills.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain theories learned to solve problems of Material Science in related task given.

CO2: Solve related problems in material science using the appropriate principles.

CO3: Demonstrate a good ethic and entrepreneurial skills in completing the given task.

**DRS1612 Material Science Laboratory**  
**Credit Hour: 2**  
**Prerequisite: None**

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### Synopsis

This course introduces students to fundamentals of experiment in material science which includes mechanical, electrical and optical measurements. Students will experience hands on learning using related experimental set ups and methods, quantitative and qualitative characterization of materials, and composition of scientific report.

### Course Outcome

By the end of semester, students should be able to:

CO1: Solve related problems in

material science and technology using the appropriate principles.

CO2: Follow the guided experiments using the correct procedures.

CO3: Organize and complete with confidence the experiments using the correct procedures.

### DRS2523 Metals & Alloys

**Credit Hour: 3**

**Prerequisite: None**

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### Synopsis

Metals & alloys course will provide understanding of fundamental knowledge of sciences; which involves investigation of chemical and physical properties of metallic elements, compounds and alloys. The course will cover metal-related technologies, iron-carbon phase diagram, metalworking processes such as casting and forging.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain theories learned to solve problems of metal & alloy in related task given.

CO2: Solve related problems in metal and alloy using the appropriate principles.

CO3: Demonstrate a good ethic and entrepreneurial skills in completing the given task.

### DRS2772 Current Issues in Science

**Credit Hour: 2**

**Prerequisite: None**

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### Synopsis

Metals & alloys course will provide understanding of fundamental knowledge of sciences; which involves investigation of chemical and physical properties of metallic elements, compounds and alloys. The course will cover metal-related technologies, iron-

carbon phase diagram, metalworking processes such as casting and forging.

### Course Outcome

By the end of semester, students should be able to:

CO1: Demonstrate an understanding of the relevant issues in broad field of sciences.

CO2: Analyze and discuss current topics in sciences including physics, chemistry and biology.

CO3: Communicate effectively in written and oral forms by completing the task given.

**DRS2782            Industry            Quality  
Management  
Credit Hour: 2  
Prerequisite: None**

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### Synopsis

This course focuses on the management of quality for manufacturing, service and public sectors to achieve global competitiveness. Emphasis is placed on new techniques for managing quality. This course is divided by two parts. Part one introduces quality assurance principles, including (i) Good Manufacturing Practices (GMP), (ii) ISO 9000 family and (iii) various continuous improvement techniques such as six sigma, lean manufacturing, 5S and total quality management and (iv) audit process. Part two focuses on the quality control system, which is concerned with (i) quality control tools used in industries, (ii) acceptance sampling, (iii) statistical data analysis, (iv) reliability and maintainability, and (v) cost of quality.

### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the basic concept of quality assurance (QA) and quality control (QC) in industries.

CO2: Analyze suitable approach to

solve problems related to industrial quality management.

CO3: Gather information from multiple sources related to quality assurance and quality control in industries.

### DRS2143 Physical Chemistry

**Credit Hour: 3**

**Prerequisite: None**

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### Synopsis

This course discusses on the fundamental principles of physical chemistry, which all

matter can exist in one of the three states: solid, liquid and gas. Besides, dimensional analysis is learnt in chemical calculations where scientific notation is a convenient way to show a number with significant figures.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain theories learned in chemistry.

CO2: Solve relevant problems in chemistry by using the appropriate principles and skills.

CO3: Respond and contribute to the need of group work in assigned task.

**DRS2232            Physical            Chemistry  
Laboratory  
Credit Hour: 2  
Prerequisite: None**

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### Synopsis

In this course, students will conduct various experiments related to physical chemistry course.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Solve related problems in chemistry using the appropriate principles.
- CO2: Conduct the experiments with the correct procedures.
- CO3: Demonstrate teamwork skills in solving the assigned tasks.

### **DRS2153 Inorganic Chemistry**

**Credit Hour: 3**

**Prerequisite: None**

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#### **Synopsis**

This course is intended to expose the key concepts in inorganic chemistry. It covers crystal field theory, common structural types, bonding as well as the physical and chemical properties of inorganic compounds.

#### **Course Outcome**

By the end of semester, students should be able to:

- CO1: Explain certain key introductory concepts in inorganic chemistry (e.g. crystal field theory, common structural types, bonding) as well as the physical and chemical properties of inorganic compounds.
- CO2: Use these concepts in problem solving, describe the chemistry of main group elements and transition metals.
- CO3: Respond and contribute to the need of group work in assigned task.

**DRS2242 Inorganic Chemistry Laboratory**  
**Credit Hour: 2**  
**Prerequisite: None**

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#### **Synopsis**

Throughout this course, student will conduct experiments related to reactivity of elements in different groups from 1A to VII A in the periodic table.

#### **Course Outcome**

By the end of semester, students should be able to:

- CO1: Explain the chemical reactions of the main group elements.
- CO2: Follow the guided experiments using the correct procedures.
- CO3: Demonstrate teamwork skills in solving the assigned tasks.

### **DRS2162 Environmental & Water Technology**

**Credit Hour: 3**

**Prerequisite: None**

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#### **Synopsis**

This course is intended to expose the central ideas and principles of environmental analysis and water treatment. It covers the prospect of analysis and water treatment in environmental chemistry.

#### **Course Outcome**

By the end of semester, students should be able to:

- CO1: Explain theories learned to solve problems of environmental and water analysis.
- CO2: Solve related problems in environmental and water analysis using the appropriate principles.
- CO3: Teamwork during water sampling.

### **DRS2343 Microbiology**

**Credit Hour: 3**

**Prerequisite: None**

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#### **Synopsis**

This course provides introduction to diversity and classification of microorganisms (bacteria, fungi, protists and viruses) and relate the microorganisms to their structures, functions and lifecycle. Students will be introduced to the culturing techniques, microbial nutrition, growth and control.

The accreditation of microbial testing laboratory in food, medical and industrial industries will be discussed.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Identify the type of microorganisms (bacteria, fungi, protists and viruses) with their structure, functions and lifecycle.
- CO2: Outline the microbial growth and control.
- CO3: Organize accreditation of microbiological testing in microbiology laboratory.

### **DRS2432 Microbiology Laboratory**

**Credit Hour: 2**

**Prerequisite: None**

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### Synopsis

This course covers practical in experiments and analyses in microbiology laboratory. Emphasis on basic techniques in handling microorganisms, including aseptic technique, media preparation, inoculation and isolation of pure culture. Analysis and control of microbial growth, and biochemical and morphological characterization, will also be carried out.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain different related microbial methods and technology using the appropriate principles.
- CO2: Follow the guided experiments using the correct procedures.
- CO3: Relate the fundamental theories with laboratory experiments.

### **DRS2353 Bioprocess Technology**

**Credit Hour: 3**

**Prerequisite: None**

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### Synopsis

The course discusses on the basic operational in bioprocess technology, unit, dimension, mass transfer at the equilibrium phase, stoichiometry of microbial growth and product formation. This course explicates the connection between microbial growth, product formation, mass transfer and environment. Likewise, this course gives an overview of the bioprocess from raw material to product. Upstream and downstream processing will be discussed. This course explains the processes and techniques used for extraction and purification of a product from culture medium. Also, bioprocess consideration in using animal and plant cell cultures will discuss using different techniques.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Describe the principle, applications and fundamental calculation in bioprocessing.
- CO2: Apply the different aspects of bioprocess application.
- CO3: Discuss the important aspects in bioprocess technology for commercialization purpose of biotechnology products.

### **DRS2442 Bioprocess Technology Laboratory**

**Credit Hour: 2**

**Prerequisite: None**

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### Synopsis

The course discusses on the basic operational in bioprocess technology, unit, dimension, mass transfer at the equilibrium phase, stoichiometry of microbial growth and product formation as well. This course explicates the connection between microbial growth, product formation, mass transfer and environment. Likewise, this course gives

an overview of the bioprocess from raw material to product. Upstream and downstream processing will be discussed. This course explains the processes and techniques used for extraction and purification of a product from culture medium. Also, bioprocess consideration in using animal and plant cell cultures will discuss

using different techniques.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Relate the fundamental theories with laboratory experiments.
- CO2: Demonstrate skills in performing bioprocess experiments.
- CO3: Manage experiment in laboratory following rules and regulations.

### DRS2362 Bioinformatics

**Credit Hour: 2**

**Prerequisite: None**

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### Synopsis

Bioinformatics is the science of storing, extracting, organizing, analyzing, interpreting, and utilizing biological information. Bioinformatics use biological information to solve biological problems. This course will deliver descriptions of this rapidly evolving field and facilitate user access to and manipulation of the biological data. Topics will include an introduction to bioinformatics, biological databases and relevant tools available to retrieve and analyze the information within these. Descriptions of various techniques, such as evolutionary analysis, data mining, protein structure/function.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain the principle and theoretical basis of the

bioinformatics tools.

CO2: Identify the bioinformatics tools for data analysis.

CO3: Recommend suitable approach to solve biological problems.

### DRS2553 Polymers

**Credit Hour: 3**

**Prerequisite: None**

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### Synopsis

Polymers course highlighted the fundamental principles of polymer chemistry and technology. This course also will cover industrial polymers and technology, including engineering and specialty polymers, composites, biopolymers, industrial polymerization technique and polymer processing. Applications of polymer technology in industrial such as polymer manufacturing including plastic, rubber, textile, etc.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain theories learned to solve problems of polymers.
- CO2: Solve related problems in polymers using the appropriate principles.
- CO3: Demonstrate a good ethic and entrepreneurial skills in completing the given task.

### DRS2543 Composites

**Credit Hour: 3**

**Prerequisite: None**

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### Synopsis

This course is intended to expose the central ideas and technical aspect of composite to students requiring a general background in the materials. It covers fundamental, classification, processing and their application towards development of composite materials. Students will be exposed on composite

material, the major constituents and various classification of composite. Students also will be teaching on the roles of the reinforcement phase and the matrix phase in composite, their manufacturing process and the properties and application of the composite.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain processing and theory learned to solve problems of composite.
- CO2: Solve related problems in composite using the appropriate processing.
- CO3: Demonstrate a good ethic and entrepreneurial skills in completing the given task.

**DRS2622 Polymers & Composites Laboratory**  
**Credit Hour: 2**  
**Prerequisite: None**

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### Synopsis

Throughout this course, student will conduct experiments which reflects to theoretical learned and actual practice in industry. As such:

it will provide an excellent foundation to fulfill the requirements of other material courses. This course consists of two related field of study which are polymer and composite. Learners are introduced to practical and hands-on activities; inclusive of (i) manipulation of instruments to perform synthesis of materials, quantitative and qualitative characterization of materials, and (ii) composition of scientific report. Learners need to synthesis the materials by using resin transfer molding, press laminating and extruder. Experiment demonstration and safety talk is scheduled to be delivered by senior academician and trained technical staff during the second

week of academic semester. Laboratory manual is given to each learner; which consists of theory, background of experiment, series of instructions, objectives, problem statement, and references.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Solve related problems in material science and technology generally and polymer and composite specifically using the appropriate principles.
- CO2: Follow the guided experiments using the correct procedures.
- CO3: Organize and complete with confidence the experiments using the correct procedures.

**DRS2553 Ceramics**  
**Credit Hour: 3**  
**Prerequisite: None**

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### Synopsis

This course is intended to expose the central ideas and principles of ceramics technology to students which requires a general background in material science. Learning activities cover several main aspects of ceramics: i.e. (i) The crystal structure of ceramics, (ii) microstructure of ceramics, (iii) oxide and non-oxide ceramics, (iv) defects in ceramics and (v) physical properties of ceramics.

Lectures will be conducted two hours per week; with two assignments throughout the semester. Learners are required to sit for two tests, and series of quizzes to ensure enough fundamental knowledge. Upon completion of the course, the learners should be able to hypothesize alternative approaches to solve problems related to ceramics using fundamental knowledge.

### Course Outcome



By the end of semester, students should be able to:

CO1: Explain theories and fundamental learned to solve problems in ceramics.

CO2: Solve related problems in ceramic using the appropriate principles.

CO3: Demonstrate a good ethic and entrepreneurial skills in completing the given task.

### **DRS2553 Ceramics**

**Credit Hour: 3**

**Prerequisite: None**

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#### **Synopsis**

The course is designed to familiarize students to computers with basic terminology, hardware and software. Students will have practical sessions throughout the course using basic applications to write a report, analyse data, edit graphic as well as video. Discussions on ethics such as how to send a proper e-mail, digital privacy and copyright will also be included in this course. All of the skills and knowledge in this course will be beneficial for the other courses.

#### **Course Outcome**

By the end of semester, students should be able to:

CO1: Acquire knowledge in basic computer terminology, hardware and software

CO2: Develop proficient skills in using basic computer hardware and software

CO3: Maintain ethics and professionalism while using computer to communicate or complete tasks

### **DRS3910 Industrial Training**

**Credit Hour: 12**

**Prerequisite: All faculty and program courses**

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#### **Synopsis**

This course provides a platform for the students to practice and apply their knowledge and skills that they have gained during their study. During the industrial training placement, students are expected to keep a log book, in which they make a regular entry describing the work they are undertaking. Then, students need to provide industrial training report to describe their technical and personal development during their placement. The industrial training report need to be submitted to the university's supervisor. Students need present their work, which will be assessed by an appointed supervisor during a visit. Students will be supervised by the industry and university supervisors to ensure achievement of the objectives for this course.

#### **Course Outcome**

By the end of semester, students should be able to:

CO1: Adapt working culture in project, consultant, construction and related industry.

CO2: Organize the industrial training knowledge, experience and skill in the preparation of the industrial training report.

CO3: Build effective communication skills in written and oral presentation

## CURRICULUM STRUCTURE DIPLOMA IN OCCUPATIONAL SAFETY AND HEALTH

YEAR	FIRST					SECOND					
SEMESTER	0	FIRST	SECOND	THIRD	FOURTH	FIFTH					
COURSES	General Chemistry 1 DUK1113	UHC1012 Falsafah dan Isu Semasa	UHC2022 Etika dan Peradaban	UHS1022 Soft Skills	DRQ2623 Emergency Response Plan	UQA1002 Co-Curriculum					
		DUM2413 Statistics and Probability	UGE1002 Entrepreneurship	UHL2432 English for Professional Communication	DRQ1322 OSH Management System	DRSS3910 Industrial Training					
		UHL2442 Essential English	UHL2412 English for Academic Communication	DRQ2432 Introduction to Epidemiology and Analysis	DRQ2723 Environmental Management and Sustainability (Elective)						
	Basic Mathematics DUM1113	DUF1113 Physics	DRQ2523 Industrial Safety	DRQ1613 Accident Investigation and Analysis	DRQ2352 OSH in Construction (Elective)	DRSS3910 Industrial Training					
		DRQ1313 Osh Risk Management	DRQ1413 Introduction to Toxicology	DRQ1613 Fundamental of Industrial Hygiene	DRQ1142 Behaviour Based Safety						
	Introduction to OSH DRO1113	DRQ1122 Introduction to Human Anatomy and Physiology	DRQ1413 Introduction to Ergonomics	DRQ1613 Hazardous Waste Management (Elective)	DRSS2162 Workplace Assessment Project						
		DRQ1212 Osh Legislations	DRQ2513 Fire and Building Safety	DRQ1613 Quality Management System (Elective)							
		DRQ1132 Osh Information and Data Management Systems									
	TOTAL CREDIT PER SEMESTER	9	19	18	18	14	14				
	TOTAL CREDIT FOR GRADUATION	92									

### ELECTIVE COURSES FOR DIPLOMA IN OCCUPATIONAL SAFETY AND HEALTH

NO.	CODE	COURSE	CREDIT HOUR
1	DRO2723	Environmental Management and Sustainability	3
2	DRO2713	Hazardous Waste Management	3
3	DRO2733	Quality Management System	3
4	DRO2532	OSH In Construction	3
Total minimum credits of elective courses for graduation *Students are compulsory to take FOUR (4) elective course during the study			12

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	Knowledge: Employable graduates with the knowledge and competency in Occupational Safety and Health
PEO2	Ethics & Professionalism: Graduates having professional attitude in fulfilling their role in Occupational Safety and Health
PEO3	Life Long Learning: Graduates engage in lifelong learning activity in their organization

PROGRAMME OUTCOMES (PO)	
PO1	Describe, interpret and apply the knowledge and theory of basic science in occupational safety and health
PO2	Perform various roles and responsibilities of occupational safety and health professionals in measuring safety and health at workplaces
PO3	Assess potential occupational safety and health problems at workplaces and the community
PO4	Apply knowledge to ensure occupational safety and health in workplaces and the community
PO5	Demonstrate sensitivities and responsibilities towards the community, culture, religion and environment
PO6	Adhere to the legal, ethical principles and the professional code of conduct in occupational safety and health
PO7	Communicate effectively orally and in writing with workers, other safety and health professionals, stakeholders and the community at large
PO8	Demonstrate leadership, interpersonal and social skills
PO9	Collaborate with other occupational safety and health professionals
PO10	Coordinate daily activities of occupational safety and health
PO11	Demonstrate basic problem-solving skills related to occupational safety and health issues
PO12	Demonstrate ICT, entrepreneurial and lifelong learning skills in their professional practice

## **COURSE SYNOPSIS FOR DIPLOMA IN OCCUPATIONAL SAFETY AND HEALTH**

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DRO1113 Principles and Practices of OSH  
Credit Hour: 3  
Prerequisite: None

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### Synopsis

This course introduces the principles and basic concepts of occupational safety and health. Students will be exposed to the history of occupational safety and health (OSH) development, acts and legislations in relation to OSH, the responsibilities and qualification of safety and health practitioner and professional ethics. The human bodies and its psychological functions and its relationship to workplace productivity will also be discussed. Introduction to Occupational Hygiene is also discussed as a foundation for the next subjects. Some common safety and health hazards will be emphasized for better understanding.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Identify the hazard, risk and exposure at the workplace to improve safety and health performance
- CO2: Explain the workplace hazards, risk and exposure that effect workers' health and planning for the best solution to improve workplace safety and health management and performance
- CO3: Discuss the occupational safety and health problems/challenges and demonstrate a scientific approach to resolves the issues

DRO1212 OSH Legislations  
Credit Hour: 2  
Prerequisite: None

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### Synopsis

This course provides a foundation for understanding the related law on Occupational Safety and Health (OSH) including act, rules, regulations, orders, guidelines and code of practice in their organization. The focuses of studies are for the students to know about the related law and apply their knowledge as OSH personnel in their organization in order to minimize hazards and accident.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain occupational safety and health related laws including act, regulations and code of practice to be applied at the workplace
- CO2: Apply related laws on occupational safety and health including act, regulations and orders to solve OSH related problems at the workplace
- CO3: Assist the organization to reduce accident and incident in the workplace by applying the related law

DRO1122 Introduction to Human Anatomy and Physiology  
Credit Hour: 2  
Prerequisite: None

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### Synopsis

This course aim is to provide an understanding of the structure (anatomy) and function (physiology) of the human body. Students will be introduced to the sciences of anatomy and physiology, anatomical organization and terminology and the hierarchical level of human body starting from cells, tissues, organs and systems.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Explain the fundamentals and basic unit of human body and physiology

CO2: Recognize the anatomical structures and explain the physiological functions of body systems

CO3: Analyze the principle of homeostasis and the use of feedback loops to control physiological systems in the human body

DUM2413 Statistics and Probability

Credit Hour: 3

Prerequisite: None

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### Synopsis

In this course, students are exposed to basic statistics and analyze statistically. The topics covered are introduction to statistics, descriptive statistics, probability, discrete probability distributions, continuous probability distributions, and correlation and simple linear regression.

### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of statistics

CO2: Perform statistical analysis by using appropriate statistical theory and methodology

CO3: Analyse real life data to solve related problems in various disciplines

DRO1423 Principles of Toxicology

Credit Hour: 3

Prerequisite: None

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### Synopsis

This course provides students with a basic understanding and appreciation of the principles of human body system and toxic effects of chemicals on the living organism, application of toxicology in human health and the effects of toxic substances on man and the environment. Topics include: disposition and metabolism of toxic

substances, types of exposure and response, toxic responses of selected body systems, toxic mechanisms of drugs, industrial chemicals, food additives, pesticides, environmental pollutants, household products and toxicity testing.

### Course Outcome

By the end of semester, students should be able to:

CO1: Apply the principles of human body system, dose-response relationship and the concept of threshold dose in relation to toxicants

CO2: Analyse organ and system toxicity associates to human health

CO3: Discuss the principles of chemical safety management in the workplace

DRO 1313 OSH Risk Management

Credit Hour: 3

Prerequisite: None

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### Synopsis

This course is aimed to give an understanding on the basic steps in recognizing hazards at work place and managing risks to as low as reasonably practicable (ALARP). These include the introduction to type of hazards, hazard identification, risk evaluation, risk assessment, determining risk control, hierarchy of risk control and risk management principle.

### Course Outcome

By the end of semester, students should be able to:

CO1: Understand the concept of identifying hazard and managing risk at workplace

CO2: Conduct hazard identification and risk assessment at workplace

CO3: Apply risk management principles in reducing risk level to As Low as Reasonably Practicable (ALARP)

DRO2423 Fundamentals of Industrial Hygiene  
Credit Hour: 3  
Prerequisite: None

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### Synopsis

This course introduces the field of industrial hygiene with emphasis on the theory and practical skills towards anticipation, recognition, evaluation and control of health hazards at workplaces. Types of health hazard, occupational exposure limits, principle of exposure monitoring and medical surveillance using standard methods for evaluating the exposure level and health risk will be introduced. This course also covers laboratory works to calibrate and use selected instruments for measuring exposure level towards the health hazards. Various approaches for control measures to minimize those hazards will be discussed. Upon completion of this course, students will be able to choose appropriate methods to identify various health hazards at the workplace and evaluate the exposure level before recommending appropriate control measures.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply basic terms, technical concepts, legal, professional and ethical frameworks integral to the practice of industrial hygiene
- CO2: Conduct industrial hygiene assessment, fieldwork using standard methodology, proper equipment and correct analysis
- CO3: Illustrate concept of anticipation, recognition and evaluation in designing hazard control to solve industrial problem

DRO1132 OSH Information and Data Management Systems  
Credit Hour: 2  
Prerequisite: None

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### Synopsis

This course aims to provide understanding on the significance role of information systems in today's organization particularly in managing organizational data and information. Students will be shared about the current practice on managing occupational safety and industrial health (OSH) information. Class discussion also will be conducted pertaining of various sources and formats of OSH information which is available. On the practical part, students will be given opportunity to explore techniques and skills on the usage of office automation system and preparing relational organizational requirement such as report and slides presentation.

### Course Outcome

By the end of semester, students should be able to:

- CO1: Analyse information systems roles in modern organization and its functions in obtaining organizational competitive advantage
- CO2: Respond to various strategies and approaches in system development
- CO3: Demonstrate the usage of office automation system in performing operational

DRO2142 Behaviour Based Safety  
Credit Hour: 2  
Prerequisite: None

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### Synopsis

This course aims to give an understanding on the basic knowledge of behavioural based safety to be implemented in workplace setting. The course also provides a clear understanding of how attitudes, cultures, and systems influence or affect behaviour, and focuses on understanding how successful behavioural change efforts really work. The students also will be exposed to the techniques of reducing the occurrence of at-risk behaviour by modifying such behaviours

through observation, feedback, and positive interventions.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply the right concepts of behaviour-based safety approach to identify the critical behaviour and barriers to safety
- CO2: Propose the right technique in determining the best intervention strategy in promoting safety culture in a workplace
- CO3: Demonstrate the ability to work in group either as a member or leader in completion of project related to behaviour-based safety

#### DRO1513 Fire and Building Safety

Credit Hour: 3

Prerequisite: None

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#### Synopsis

This course aims to expose students on the physical and chemical properties of fire that will lead to a better understanding on fire hazard and selecting the most appropriate control measures. This course also highlights the safety and health best practices to be applied in the industry. The course will cover topics such as Basic Principles of Fire and its category, the Components of Fire Safety, the Active and Passive Fire Safety Systems, the Life Cycles of a Building, Loss Impact and Means of Escape During Emergencies

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply basic principle of fire prevention, fire protection and control system in a building
- CO2: Assist the organization to implement the best control measure in fire prevention and protection
- CO3: Adapt loss impact of fire to

individual, organization, society and the country.

#### DRO1153 Introduction to Ergonomics

Credit Hour: 3

Prerequisite: None

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#### Synopsis

This course provides a foundation for understanding the key concepts and principles related to ergonomics. The aim of ergonomics in industry is to increase productivity, and decrease accidents and illnesses by obtaining a good fit between the employer and the job. Examines relationships between employer, work equipment and work environment.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply the fundamentals knowledge on ergonomics to predict the impact of various personal attributes (anatomical, physiological and psychological) for safe working practice
- CO2: Provide solution based on ergonomic design problem, design of work areas and equipment to a range of occupational settings
- CO3: Conduct ergonomic risk assessment using ergonomics risk assessment tools

#### DRO1523 Industrial Safety

Credit Hour: 3

Prerequisite: None

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#### Synopsis

This course provides students basic knowledge in industrial safety and its application in the hazards identification and risk management. Students will be exposed to all physical hazards such as machinery, pressure vessel, material handling equipment, welding, confined space and

electrical. Introduction to process safety and construction safety also will be introduced to students.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Categorize physical hazards in the industries

CO2: Apply industrial safety related legislations in the industries

CO3: Analyze any issue or incident on physical hazards to solve industrial safety problems

#### DRO2432 Introduction to Epidemiology and Diseases

Credit Hour: 2

Prerequisite: None

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#### Synopsis

This course gives an overview of occupational health and health related problem with emphasis on the study of disease occurrence among working population. The basic concept of disease transmission and causation, measuring occurrence of disease, determining the cause of disease and estimating risk will be discussed. The major types of epidemiologic study design used to investigate the disease occurrence will be introduced. Other topics to be highlighted include threats to validity and issues in interpreting epidemiologic data such as bias, confounding factors, and random error. This course also covers the prevention of communicable and non-communicable diseases at the workplace. Upon completion of this course, students will be able to illustrate the epidemiologic concepts and methods to environmental and occupational health issues.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the principle of disease

causation, and the epidemiologic approach to defining and measuring the occurrence of health-related states in populations.

CO2: Contrast the main types of study design in term of characteristics, strengths, weaknesses and risk measurements

CO3: Illustrate the epidemiologic concepts and methods to environmental and occupational health issues

#### DRO2733 Quality Management System

Credit Hour: 3

Prerequisite: None

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#### Synopsis

The course provides a comprehensive understanding in the fields of quality management and process improvement. The quality management principles, performance management, and quality improvement alongside relevant tools, techniques, models and frameworks will be learnt.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Demonstrate a working knowledge of the principles and practices of quality management

CO2: Display quality tools and techniques for continuous quality improvement

CO3: Describe the quality implementation plans for the strategic issues in quality management

#### DRO2814 Workplace Assessment Project

Credit Hour: 4

Prerequisite: None

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#### Synopsis

This course will expose students to project activities using the established methods in



accordance to the teaching subjects offered in the program. Each student will apply their technical skills to carry out measurements, monitoring and analyses during field work and laboratory analysis as proposed in the project proposal. The project will be conducted individually with the consultation by the respective lecturer who assigned as supervisor of project.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Perform the technical skill for executing project activities
- CO2: Organize a report of the project conducted in a scholarly manner using scientific approach
- CO3: Defend findings of the project conducted

#### DRO2613 Accident Investigation and Analysis

Credit Hour: 3

Prerequisite: None

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#### Synopsis

This course provides student with knowledge for accident investigation and analysis. Topics cover data collection, investigation and interviewing techniques, notification and reporting to authority, corrective and preventive actions to prevent recurrences. Root cause analysis techniques commonly used in the industry will also be introduced to students

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Analyze accident root cause by using root cause analysis techniques
- CO2: Conduct accident investigation at workplace
- CO3: Initiate accident notification and reporting to authority based on legislation

#### DRO2623 Emergency Response Plan

Credit Hour: 3

Prerequisite: None

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#### Synopsis

This course provides student with introduction to emergency response planning. Types of emergency hazards will be discussed including its specific response including first aid. Student also will be exposed to communication during emergency, Incident Command System (ICS) and Arahan Majlis Keselamatan Negara 20. The student will be trained to conduct emergency drill including table top exercise.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Conduct emergency response exercise at workplace.
- CO2: Apply knowledge on emergency response planning at workplace
- CO3: Demonstrate interpersonal skills in handling emergency response matters

#### DRO2533 OSH in Construction

Credit Hour: 3

Prerequisite: None

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#### Synopsis

This course is designed for persons who work in the construction industry. This course will provide all members with greater safety in construction field particularly referred to construction safety awareness. It is also designed to increase their confidence in the action to take in case of any emergencies. The stages of construction and most of the building process within the life cycle of a building will be elaborated. All the relevant document and acts particularly relating to Malaysia scenario are among the important references that will be discussed along with the sequence of building construction. Students are expected to venture into a general safe working practices at

construction site and able to supervise the total environment as a free accident area.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Identify the hazardous materials, substances and unsafe practices at construction industry.
- CO2: Apply the level of risk and safety of work places compliance to the national safety regulation.
- CO3: Apply a proposal to enhance and increases a safer work practices in construction industries.

#### DRO2733 OSH Management System

Credit Hour: 3

Prerequisite: None

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#### Synopsis

This course will expose the candidates to the latest and existing Occupational Safety and Health Management System (OSH-MS), the evolution and the elements in the systems that cater current requirement in OSH. The course also introduces the concepts, relationships and principles of managing the OSH function and the development of training procedures and practices to integrate that function into the organization.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply the PDCA cycle and OSH-MS models based on recognized standards
- CO2: Analyze all phase in OSHMS; policy, hazard and risk analysis, compliance of legal and other requirements, objectives and programs
- CO3: Communicate ideas professionally in relation to Occupational Safety and Health Management System

#### DRO2713 Hazardous Waste Management

Credit Hour: 3

Prerequisite: None

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#### Synopsis

This course discusses about the basic concept on waste, types and sources of waste and its management application. It includes the physical, chemical and biological properties of wastes which are the basis for their hazard classification, movement and distribution as well as their impacts on human health and the environment. The management of these wastes which include handling, storage and transportation based on the regulations stipulated in the Environmental Quality Act, 1974, Solid Waste and Public Cleansing Management Act, 2007, as well as other international regulations will be discussed. Understanding on the treatment and disposal processes will be emphasized including pollution prevention and waste minimization strategies.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply the theories and principle of waste management to prevent risks towards human health and environment
- CO2: Apply knowledge and skills to ensure occupational safety and health in workplaces and the community
- CO3: Relate the legal requirements on waste management with safety and health aspects

#### Synopsis

This course discusses about the basic concept on waste, types and sources of waste and its management application. It includes the physical, chemical and biological properties of wastes which are the basis for their hazard classification, movement and distribution as well as their

impacts on human health and the environment. The management of these wastes which include handling, storage and transportation based on the regulations stipulated in the Environmental Quality Act, 1974, Solid Waste and Public Cleansing Management Act, 2007, as well as other international regulations will be discussed. Understanding on the treatment and disposal processes will be emphasized including pollution prevention and waste minimization strategies.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Apply the theories and principle of waste management to prevent risks towards human health and environment
- CO2: Apply knowledge and skills to ensure occupational safety and health in workplaces and the community
- CO3: Relate the legal requirements on waste management with safety and health aspects

#### DRO2723 Environmental Management and Sustainability

Credit Hour: 3

Prerequisite: None

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#### Synopsis

This subject will provide exposure on current environmental issues as well as applicable legislations in the country. The discussion will focus on sources of pollution, fundamental sciences, monitoring methods and control technology available in the market. Environmental management tools such as Environmental Impact Assessment (EIA) and Environmental Management System (EMS) also discussed.

#### Course Outcome

By the end of semester, students should be

able to:

- CO1: Determine the source of pollutions, impact of specific pollutants and best available technology to control and mitigate
- CO2: Express responsibilities towards the community, culture, religion and environment
- CO3: Adopt the current environmental management and technology issues with environmental legislations

#### DRO3912 Industrial Training

Credit Hour: 12

Prerequisite: All faculty and program courses

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#### Synopsis

This course aims to give chances for the student to practice and apply their knowledge and skills that they gain during their study. During the placement, we expect students to keep a log book, in which they make a regular entry describing the work they are undertaking. Student are supervised by industrial and university supervisors to guide and ensure they can do their work as good as possible and achieve the objective for this course.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Demonstrate skills by applying the theory learned for real problem solving in organization
- CO2: Demonstrate skills by applying the theory learned for real problem solving in organization





# **FACULTY OF MANUFACTURING AND MECHATRONICS ENGINEERING TECHNOLOGY**

**COURSE INFORMATION 2022-2023**

### CURRICULUM STRUCTURE B. ENG (HONS.) MANUFACTURING ENGINEERING

YEAR SEMESTER	FIRST		SECOND		THIRD		FOURTH
	FIRST & SECOND	FIRST & SECOND	FIRST & SECOND	FIRST & SECOND	FIRST & SECOND	FIRST & SECOND	
MANUFACTURING ENGINEERING CORE COURSES	BFF1103 Statics	BFF2801 Electrical/Electronics Lab	BFF3103 Vibrations	BFF3622 Computer Aided Manufacturing	BFF4902 Final Year Project 1	BFF4902 Final Year Project 1	BFF4902 Final Year Project 1
	BFF1801 Machining 1	BFF1123 Dynamics	BFF3622 Computer Aided Manufacturing	BFF3242 Heat Transfer	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2
	BFF2003 Computer Programming	BFF1133 Mechanics Of Materials	BFF3242 Heat Transfer	BFF3632 Design of Jigs & Fixtures	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2
	BFF1113 Engineering Materials	BFF2612 Computer Aided Engineering Design	BFF3632 Design of Jigs & Fixtures	BFF3**3A Manufacturing Elective 1	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2
	BFF1602 Technical Drawing	BFF2423 Manufacturing Processes	BFF3**3A Manufacturing Elective 1	BFF3123 Machine Design	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2
	BFF1811 Machining 2	BFF2223 Fluid Mechanics	BFF2821 Mechanics Lab	BFF4103 Control System Engineering	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2
	BFF1502 Project Management	BFF2233 Thermodynamics	BFF2433 Advanced Manufacturing Processes	BFF4911 Environment Safety & Health	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2
	BFF1343 Fundamental Of Electrical Engineering	BFF2523 Quality Engineering	BFF3**3B Manufacturing Elective 2	BFF4533 Manufacturing Automation	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2
	BFF1353 Fundamental of Electronics Engineering	BFF2513 Manufacturing System	BFF3313 Sensor and Instrumentation Systems	BFF3523 Production Planning and Control	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2
	BFF1932 Engineers in Society	BFF1922 Engineering Economy	BFF3801 Thermal-Fluid Engineering Lab	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2	BFF4914 Final Year Project 2
23	26	29	6	25			
109	23	26	29	6	25		
29	University Required Courses: Applied Calculus, Applied Statistics, Ordinary Differential Equations, English For Academic Communication, English for Technical Communication, Fundamental of English Language, English for Professional Communication, Falsafah dan Isu Semasa, Penghayatan Etika dan Peradaban, Foreign Languages Level 1, Foreign Languages Level 2, Soft Skill, Co-Curriculum I, Co-Curriculum II, Technopreneurship, Elective Courses PBMSK						
138	Total Credit for Graduation						

**ELECTIVE COURSES FOR  
B.ENG (HONS.) MANUFACTURING ENGINEERING**

NO.	CODE	COURSE	CREDIT HOUR
1	BFF3403	Advanced Machining	3
2	BFF3603	Plastics Product Design	3
3	BFF4603	Mold 1	3
4	BFF4613	Mold 2	3
5	BFF3613	Sheet Metal Product Design	3
6	BFF4613	Die 1	3
7	BFF4633	Die 2	3
8	BFF3553	Mechanization Approach to Process Improvement	3
9	BFF3563	Process Auditing Techniques	3
10	BFF4563	Production Line Management	3
11	BFF4573	Six Sigma	3
12	BFF4503	Factory Management	3
13	BFF4513	Lean Production System	3
14	BFF3583	Industrial Ergonomics	3
15	BFF4663	Maintenance and Reliability	3
16	BFF3593	Additive Manufacturing	3
<b>TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION</b>			<b>12</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

<b>PEO1</b>	To produce engineering technologists with mastery of the needed expertise in manufacturing industries using the foundation of technology and innovation.
<b>PEO2</b>	To prepare engineering technologists that demonstrate skills of lifelong learning for professional and personal development.
<b>PEO3</b>	To prepare engineering technologists with good management skill, good professional ethics and understanding local law in manufacturing issues.
<b>PEO4</b>	To prepare global engineering technologists that work and communicate effectively in multinational and multidisciplinary engineering community.

**PROGRAMME OUTCOMES (PO)**

<b>PO1</b>	Apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to define and manufacturing engineering technology procedures, processes, systems or methodologies
<b>PO2</b>	Solve broadly-defined engineering technology problems systematically to reach substantiated conclusions by using tools and techniques appropriate to manufacturing engineering technology field.
<b>PO3</b>	Design solutions for broadly-defined manufacturing engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
<b>PO4</b>	Plan and conduct experimental investigations of broadly-defined problems using data

	from relevant sources
<b>PO5</b>	Select and apply appropriate techniques, resources and modern engineering technology tools, with an understanding of their limitations
<b>PO6</b>	Function effectively as individuals, and as members or leaders in diverse technical teams.
<b>PO7</b>	Communicate effectively with the engineering community and society at large
<b>PO8</b>	Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
<b>PO9</b>	Demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
<b>PO10</b>	Demonstrate an awareness of management, business practices and entrepreneurship
<b>PO11</b>	Demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.
<b>PO12</b>	Recognize the need for professional development and to engage in independent and lifelong learning



## COURSE SYNOPSIS FOR DEGREE PROGRAMME 2022/2023

### COURSE SYNOPSIS FOR MANUFACTURING PROGRAMME (BFF)

#### **BFF1103 Statics**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces the concepts of force vector algebra and free-body diagrams to solve problems on equilibrium of forces. The course covers six major chapters in engineering mechanics of statics as follows: 1. equilibrium of forces on a particle, 2. equilibrium of forces on a single rigid body, 3. equilibrium of forces on simple trusses, frames and machine structures (multi-rigid bodies), 4. Equilibrium of forces in dry friction, 5. Centre of gravity and centroid and 6. Moments of inertia.

By the end of semester, students should be able to:

- CO1: Solve problems on equilibrium of forces for particles and rigid bodies using the equation of equilibrium
- CO2: Analyse problems on equilibrium of forces for trusses, frames and machines
- CO3: Analyse problems on equilibrium of rigid bodies subjected to dry frictional forces
- CO4: Determines the centre of gravity, centroid and moment of inertia for a body of arbitrary shape
- CO5: Design solutions for complex engineering problems for a simple structure in equilibrium

#### **BFF1113 Engineering Materials**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces the fundamental concepts of engineering materials which includes the structure of materials, mechanical and physical properties of materials, binary phase diagrams, isothermal diagram, heat treatment, applications and

current developments of metal, polymer, ceramic, composite and advanced materials. Also, basic understanding on the environmental degradation of engineering materials.

- CO1: Identify the atomic bonding and the crystal structures as well as the mechanical and physical properties of engineering materials.
- CO2: Analyse various types of engineering materials based on their microstructures, properties and failure behaviors.
- CO3: Illustrate structure-property correlations of materials based on phase diagram, heat treatment and strengthening mechanism.
- CO4: Recommend a suitable material for engineering applications based on product design requirements.
- CO5: Identify the importance of environmental considerations and sustainability in engineering materials.
- CO6: Communicate effectively regarding materials-related projects in oral presentation.

#### **BFF1123 Dynamics**

**Credit Hours: 3**

**Prerequisite: BFF1103**

#### Synopsis

This course covers rigid body kinematics and kinetics of 2D planar motions. At the course, the students should be able to analyse the position, velocity and acceleration of a 2D planar mechanism. Furthermore, by applying either the principle of force-acceleration, work-energy, and/or impulse-momentum, the students should be able to solve the kinetics problems of 2D planar motion. This course also requires the students to design a 2D planar mechanism that performs a specific function.

- CO1: Analyse the linear velocity and acceleration of a point, or angular velocity and angular acceleration of remaining links including the Coriolis acceleration if applicable.
- CO2: Apply Newton's Second Law of Motion to determine the acceleration and angular acceleration of a body.

- CO3: Apply the Principle of Work and Energy to determine the velocity and angular velocity of a body.
- CO4: Apply the Principle of Impulse and Momentum to determine the velocity and angular velocity of a body.
- CO5: Design a 2D planar mechanism that performs a specific function and to prepare a report that demonstrates the knowledge of velocity and acceleration.

### **BFF1133 Mechanics of Materials**

**Credit Hours: 3**

**Prerequisite: BFF1103; BFF1113**

#### Synopsis

This course introduces the concept of stress, strain and mechanical properties of materials under axial, torsion, bending, transverse, and shear and combined loadings in elastic structural members. Plane stress transformation is also included.

- CO1: Identify the concept of stress, strain and different mechanical properties of materials.
- CO2: Analyse the stress and strain in structural members subjected to the axial loads and torsional loads.
- CO3: Analyse the stress and strain in structural members subjected to the bending loads and shear loads.
- CO4: Analyse the stress and strain in structural members subjected to the combined load and analyse the stress transformation to solve the mechanics of materials problems.
- CO5: Design solutions for complex engineering problem related to mechanics of materials

### **BFF1343 Fundamental of Electrical Engineering**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces DC circuit and AC circuit analyses. It covers the fundamental laws and theorems, circuit techniques, transient analysis, sinusoidal steady-state analysis and three-phase systems.

- CO1: Apply fundamental laws, circuit theorems and method of analysis to solve electrical circuit
- CO2: Analyse transient response and steady-state response of circuit applications
- CO3: Analyse balanced and unbalanced three-phase systems
- CO4: Analyse electrical circuit using simulation software

### **BFF1353 Fundamental of Electronics Engineering**

**Credit Hours: 3**

**Prerequisite: BFF1343**

#### Synopsis

This course covers the fundamental and applications topics of analog and digital electronics including devices, circuitry, system, and analysis techniques. For analog electronics, it also covers diodes, bipolar junction transistors (BJT), field effect transistors (FET), and operational amplifiers (Op-Amp). For digital electronics, it also covers different number systems, Boolean Algebra theorems, and combinatorial logic circuits.

- CO1: Explain the principle operation and characteristics of diode, bipolar junction transistor (BJT), and field effect transistor (FET) devices and analyse its operation
- CO2: Explain and analyse the operation of various type of operational amplifier circuits and applications
- CO3: Use different number system to represent data and binary codes for representing numeric and alphanumeric data and apply the Boolean Algebra theorems for simplification of complex logic expression
- CO4: Analyse and design of combinatorial logic

### **BFF1502 Project Management**

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

This course embraces a broad basic overview and principles of project management which has become central to operations in manufacturing enterprises throughout five stages of managing project; initialization, planning, execution, control and closing.

- CO1: Develop a project charter which describes a preliminary framework of project's goal, scopes and high level deliverables.
- CO2: Develop a project planning using management tools
- CO3: Propose task scheduling using an ordered sequence of activities with time allotted
- CO4: Evaluate actual performance at any of project duration

### **BFF1602 Technical Drawing**

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

This course introduces fundamental knowledge and skill of technical drawing for engineers. Both hand sketching and CAD approach will be used in this course. Student will be exposed with Fundamental of Engineering Graphic Language; Layout and Lettering; Technical Sketching; Geometric Constructions; Basic and Advanced Dimensioning; Orthographic Drawing; Section and Auxiliary Views; Geometric Dimensioning and Tolerance (GD&T); and 2D Parametric Drawing Construction. This course also preparing the student to create and interpret working technical drawing according to ISO standards

- CO1: Apply standard procedures in sketching and technical drawing.
- CO2: Manipulates CAD for 2D drawing based on orthographic projections and section views.
- CO3: Analyze the geometric dimensioning and tolerance (GD&T) to explicitly describe geometry, variation and accuracy in engineering drawing
- CO4: Develop standard drawing package consists of 2D assembly drawing, parts list and detailed part drawing.
- CO5: Show the ability to be an effective team player based on the completion

of tasks and involvement in group activities.

### **BFF1801 Machining 1**

**Credit Hours: 1**

**Prerequisite: None**

#### Synopsis

This course introduces the students to the fundamental knowledge and principle of metal removing process. In this course, students will apply theoretical knowledge to perform the actual material removal operation using appropriate tools and techniques according to required dimensions, tolerance, and specification and safety regulations.

- CO1: Apply the role of safety and regulatory compliance of hand tools and lathe machine
- CO2: Analyse various types of drawings, material removal processes and machining parameters
- CO3: Perform basic material removal processes using hand tools and lathe machine with correct sequence of machining operation

### **BFF1811 Machining 2**

**Credit Hours: 1**

**Prerequisite: None**

#### Synopsis

This course introduces students on safety rules, metrology, milling process and surface grinding and machining process.

- CO1: Apply the safety and health procedures during machining
- CO2: Apply skill in part inspection during machining
- CO3: Apply technical skill in milling process
- CO4: Apply technical skill in surface grinding process
- CO5: Practice right standard operation procedure and ethics for machining work

### **BFF1932 Engineer in Society**

**Credit Hours: 2**

**Prerequisite: None**

**Synopsis**

This course introduces the engineering profession, local industries sector, issues in local industries, ethics and public responsibility, engineering and law, and contract law.

- CO1: Discuss the engineering practices in local manufacturing industries.
- CO2: Adheres the practice and laws which govern engineering population for environmental and sustainable development.
- CO3: Apply responsibility for one's working ethics and public responsibility in engineering practices.

**BFF1922 Engineering Economy****Credit Hours: 2****Prerequisite: None****Synopsis**

This course introduces the concept of life cycle cost, interest and equivalent. Formula and factors for single and multiple cash flow. Method for investments assessment and alternative comparison and project evaluation using cost worth ratio, inflation and cash flow method.

- CO1: Analyse the cost concept, cost structure and estimation
- CO2: Analyse the money-time relationship with/without taxes consideration
- CO3: Justify the best economical alternative in private and public engineering projects

**BFF2003 Computer Programming****Credit Hours: 3****Prerequisite: None****Synopsis**

This course introduces the basics of the C programming language. The contents of this course includes coding input and output, variables, constants, arithmetic operations, mathematical functions, user-defined functions, loops, selection making decision and repetitive construct, array, and also data structure. The programming language used for the course is C/C++ language.

- CO1: Solve a mathematical problem using variables, constants, arithmetic operations, mathematical functions and user-defined functions with the correct rules.
- CO2: Organizes the flow of a program that uses decision making, repetition and loop statements without any errors.
- CO3: Write an organised and readable C program code without producing compile and output result errors.
- CO4: Develop a program code that is related to manufacturing applications that follows a design specification.
- CO5: Analyse the handling of arrays in a program to ensure correct calculated output is produced.

**BFF2223 Fluid Mechanics****Credit Hours: 3****Prerequisite: BFF1103****Synopsis**

This course is a fundamental course for engineering students which presents unlimited practical applications from daily life to related industrial fields. Students taking this course are expected to have an adequate background of calculus, physics and engineering mechanics. Lesson will be covering the fundamental concepts of fluids, fluid properties, problem analysis for fluids at static and in motion, fluid flow in pipeline and dimensional homogeneity concept. Students will be also exposed to the application of complex engineering problems such as the utilization of Computational Fluid Dynamics (CFD) to enhance their problem solving skills and competency.

- CO1: Analyse forces applied by fluids at rest.
- CO2: Analyse mass, Bernoulli and energy equations associated with fluids in motion.
- CO3: Analyse minor and major losses, pressure drop and pumping power requirement of laminar and turbulent flow in pipes.
- CO4: Analyse dimensional homogeneity of equations, method of repeating variables to obtain non-dimensional parameters and similarity principle for experimental modelling.

CO5: Develop solutions for complex engineering problems to solve flow characteristics in pipes.

CO6: Produce a comprehensive report to demonstrate implemented projects.

### **BFF2233 Thermodynamics**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course focuses on the application of thermodynamics knowledge in various engineering systems. The subject covers the review and analysis of energy, concepts of thermodynamics laws and entropy, heat engines, refrigerators and heat pumps cycles.

CO1: Analyze thermodynamics fundamental concepts which includes energy, state, temperature, pressure, process and cycle.

CO2: Analyze the properties of pure, simple compressible substances and ideal gases.

CO3: Analyze the concept of 1st law of thermodynamics in closed and open systems.

CO4: Analyze entropy change in 2nd law of thermodynamics.

CO5: Design engineering project on thermodynamics.

CO6: Communicate effectively regarding principles of thermodynamics aspects of engineering design.

### **BFF2423 Manufacturing Processes**

**Credit Hours: 3**

**Prerequisite: BFF1113**

#### Synopsis

This course introduces various challenges and issues in modern manufacturing process and operations, ranging from traditional topics such as casting, forming, machining and joining process.

CO1: Ability to describe manufacturing process of metal casting, forming and shaping, joining and surface technology

CO2: Analyse the mechanics and processing parameters of metal

casting, forming, joining and surface technology

CO3: Propose a design of manufacturing process system that can be used in production that can contribute to public health and safety, cultural, societal, environmental and sustainability

CO4: Recommend an optimized process parameters of a manufacturing process using research methods

### **BFF2433 Advanced Manufacturing Processes**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course covers the processing of ceramics, glasses, superconductors, plastics, and composite materials. This course also covers rapid-prototyping processes and operations, advanced machining processes and equipment, fabrication of microelectronic devices, and fabrication of micro electromechanical devices and systems and Nano-scale manufacturing.

CO1: Comprehend knowledge in advanced manufacturing processes.

CO2: Analyze engineering problems related to advance manufacturing processes.

CO3: Apply investigation in related topic advanced manufacturing processes.

CO4: Follow ethical during exercises covering advanced manufacturing processes.

CO5: Perform life-long learning in the subject of advanced manufacturing processes.

### **BFF2513 Manufacturing System**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course provides in-depth understanding of manufacturing system components, Manufacturing Operations, Models and Metrics useful to evaluate them, Material Transport and storage systems, analysis of Single cell, Cellular Manufacturing and Flexible Manufacturing systems. Deals with

the analysis of manual and automated assembly systems.

- CO1: Understand the concepts of manufacturing systems and analyse the performance of these systems using different metrics.
- CO2: Analyse the material handling and storage systems in different manufacturing environments
- CO3: Quantify the performance of single cells, cellular manufacturing systems, flexible manufacturing systems and assembly lines
- CO4: Evaluate the suitability of modern manufacturing philosophies to improve the performance of manufacturing systems.

### **BFF2523 Quality Engineering**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course is the application of statistical, mathematical and management methods for improving the quality and reliability of industrial products, processes and systems. Thus, the concept of basic quality tools, fundamentals of statistics, control charts for variables and attributes, fundamentals of probability and acceptance sampling systems are the key success of this course.

- CO1: Determine the measures of frequency distributions, central tendency, dispersion and normal curve when the data are systematically gathered
- CO2: Analyze the variations that occur in the central tendency and mean of a set of observation
- CO3: Analyze the quantitative data to improve process, develop a new product and establish a statistical control
- CO4: Discover the application of optimization among society

### **BFF2612 Computer Aided Engineering Design**

**Credit Hours: 2**

**Prerequisite: BFF1602**

#### Synopsis

This course introduces 3D surface solid modelling which emphasizes the drawing, functioning and organizing the model. Further course content included part assembly, animation and basic FEA application. Students experience practical learning through the CAD software.

- CO1: Apply the knowledge of geometric modelling concepts used in commercial CAD/CAM software
- CO2: Construct 3D parts, assembly models and drafting according to the engineering standards
- CO3: Assess the part models with basic Finite Element Analysis (FEA) simulations
- CO4: Communicate effectively on the topic of geometric modelling

### **BFF2801 Electrical/Electronics Lab**

**Credit Hours: 1**

**Prerequisite: BFF1353**

#### Synopsis

This course introduces practical electrical circuits. Students should analyse, synthesis and build circuits using passive/active components

- CO1: Apply electrical fundamental technique to solve circuit using modern tools
- CO2: Implement fundamental electrical and electronic principle and devices to solve circuit problem
- CO3: Develop an integration of electrical system for an application in a group

### **BFF2821 Mechanics Lab**

**Credit Hours: 1**

**Prerequisite: BFF1123**

#### Synopsis

This lab introduces principles of engineering and solid mechanics through practical experiments. The covered areas are for principles of statics, dynamic and mechanics of materials.

- CO1: Analyze engineering mechanics problems for a rigid body at rest and in motion

- CO2: Demonstrate understanding about mechanical properties of engineering structures.
- CO3: Demonstrate ethical principles and commitments of professional ethics on lab practices

### **BFF3103 Vibrations**

**Credit Hours: 3**

**Prerequisite: BFF1123**

#### Synopsis

This course introduces the fundamentals of vibration, free vibration (Single Degree of Freedom-SDOF System), harmonically excited vibration (SDOF System), general excited vibration (SDOF System), two degrees of freedom (TDOF System), and vibration control.

- CO1: Analyze the single degree of freedom system vibration and harmonically excited vibration
- CO2: Analyze the two degree of freedom system vibration and control vibration method
- CO3: Demonstrate the vibration solution for engineering problem
- CO4: Apply the modern tools for solving vibration problem

### **BFF3123 Machine Design**

**Credit Hours: 3**

**Prerequisite: BFF1133, BFF1123**

#### Synopsis

This course focuses on the fundamentals of component design - free body diagrams, force flow, concepts, failure theories, and fatigue design, with application to fasteners, springs, bearings, gears, shafts, clutches, and brakes. It explains the basics of mechanics, strength of materials, and materials properties on how to apply these fundamentals to specific machine components design.

- CO1: Analyze the concept of machine design, Design considerations for the machine elements, Load and stress analysis, design of compression members

- CO2: Analyze the failure of machine components due to static and variable loadings, Design of shafts
- CO3: Design of power screws and mechanical springs
- CO4: Design of bearings, gears, clutches and flexible mechanical elements
- CO5: Design solution for engineering problems related to the course content

### **BFF3242 Heat Transfer**

**Credit Hours: 2**

**Prerequisite: BFF2233**

#### Synopsis

The course covers the modes of heat transfer (through conduction, convection and radiation) in a model of heat transfer system.

- CO1: Analyse manufacturing and mechatronics engineering problems as either conduction, convection or radiation problems and model them as a heat transfer system
- CO2: Apply specific knowledge of thermo fluids principles and heat transfer mechanisms (conduction, convection or radiation) to the heat transfer system
- CO3: Design solutions for engineering problems based on course content
- CO4: Propose the impact of heat transfer engineering for the environment

### **BFF3313 Sensor & Instrumentation Systems**

**Credit Hours: 3**

**Prerequisite: BFF2801**

#### Synopsis

This course covers instrumentation systems including instrument principles, measurement techniques and data analysis for a particular sensor and measurement situation.

- CO1: Determine general treatment of instruments and their characteristics
- CO2: Analyse transducer elements, intermediate elements and data acquisition systems (DAQ)
- CO3: Determine principles of the work and derive mathematical models of sensors for measuring motion and

vibration, dimensional metrology, force, torque and power, pressure, temperature, flow and acoustics.

CO4: Develop team-oriented projects for interfacing data acquisition systems with applications.

### **BFF3403 Elective: Advanced Machining**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course will introduce the knowledge and technologies in precision machining, technique of making tool and die and engineering measurement using industrial standard equipment

CO1: Evaluate advanced machining process input parameter toward machining quality and failure surface quality and failure

CO2: Conduct machining of a complex product using optimized tool path and machine parameters.

CO3: Communicate effectively in presenting project outcomes

CO4: Function effectively in a teamwork

### **BFF3603 Elective: Plastics Product Design**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

In this course students will be introduced with plastic product design including plastic materials selection, design for strength, features for assembly and design for injection moldings process.

CO1: Apply knowledge in designing engineering plastic product including material selections, general design practice, design for strength and design for assembly

CO2: Design an engineering plastic product using CAD software.

CO3: Analysed the plastic product using Finite element software and suggest improvement

CO4: Communicate effectively in presenting the project outcomes

### **BFF4603 Elective: Mold 1**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

In this course students will be introduced with the knowledge and technologies in plastic injection mold constructions as well as designing a mold for plastic injection molding process.

CO1: Identify plastic mold construction and component

CO2: Define the plastic mold types

CO3: Define the plastic mold auxiliary system

CO4: Design the plastic injection mold

### **BFF4613 Elective: Die 1**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course enhances student's competencies in various die design applied in the sheet metal stamping industry. Student's project will be emphasized on technical aspects in progressive die design and process planning for die fabrication.

CO1: Analyse various die construction commonly used in sheet metal stamping industries

CO2: Analyse the principal and methodological in progressive die design.

CO3: Design strip layout of a progressive die according to product specification

CO4: Design a progressive die and prepare detailed process planning for die fabrication.

### **BFF4623 Elective: Mold 2**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

In this course students will fabricate the components of the mold according to the detail drawing and process planning, assemble the mold components, inject the product as well as analyze the quality of the final plastic product



- CO1: Analyse the advance plastic injection mold design
- CO2: Examine the machining process and plan sequences for the plastic mold fabrication
- CO3: Conduct the machining operation and construct the mold according to the dimension and specification
- CO4: Communicate effectively in a project work
- CO5: Function effectively in a teamwork

**BFF4633 Elective: Die 2**  
**Credit Hours: 3**  
**Prerequisite: None**

Synopsis

In this course students will fabricate the components of the die according to the detailed drawing and process planning, assemble the die components, conduct stamping trials and analyse the quality of the final sheet metal product.

- CO1: Develop process planning on die fabrication
- CO2: Construct and assemble die components
- CO3: Demonstrate stamping trial and troubleshoot the die system
- CO4: Evaluate the quality of stamped parts

**BFF4503 Elective: Factory Management**  
**Credit Hours: 3**  
**Prerequisite: None**

Synopsis

This course is designed to provide students with an understanding of Factory Management (FM) concepts, issues, strategies, management approaches and tools commonly used in factories. The main topics which are covered are Operations and Supply Chain Management, Quality Management, Product Design, Processes and Technology; Capacity and Facilities Design, Human Resources, Supply Chain Management Strategy and Design; Global Supply Chain Procurement and Distribution; Resource Planning and Lean Systems.

- CO1: Apply the concepts, systems and strategies relevant to factory operation management
- CO2: Analyse the problems associated with factory planning and control of the production of goods and services.
- CO3: Act as facilitating managers to deploy tasks and execute the decision made in a management meeting.

**BFF3563 Elective: Process Auditing Techniques**  
**Credit Hours: 3**  
**Prerequisite: None**

Synopsis

This course introduces the concept of basic internal auditing program i.e. step by step to be an effective auditor; establish audit program; implement audit execution; analyse audit findings and prepare audit report for Quality Management Systems (QMS); Environmental Management System (EMS) and relevant management systems.

- CO1: Apply effective internal audit programs for any organisations.
- CO2: Prepare audit report based on analysis of audit findings
- CO3: Conduct internal audit program in a manufacturing company

**BFF4513 Elective: Lean Production System**  
**Credit Hours: 3**  
**Prerequisite: None**

Synopsis

This course introduces the role of lean production systems in a manufacturing environment. The concept of value adding and waste elimination through implementing lean production systems. Using the basic principle of Pull system to promote waste elimination, various Lean tools would be introduced which include value stream mapping, Pull System & Kanban, Heijunka, and Cellular manufacturing.

- CO1: Analyse principles of lean production to a manufacturing environment by identifying the different type of

wasteful activities, value added and non-value added activities

CO2: Propose process improvement through implementation of pull system in the process by planning pull mechanism such as Kanban system and Heijunka technique

CO3: Perform a value stream mapping (VSM) study for a manufacturing process from the incoming material until product delivery and propose a future value stream map to minimize the non-value added activities

### **BFF4643 Elective: Production Line Management**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces the basic approach to effectively managing the production line from receiving the manufacturing order to producing the required quantity, meeting the quality requirements, delivering on-time and realizing the product with optimal cost.

CO1: Identify and analyze the fundamental steps required to be performed to ensure each manufacturing order met the objectives

CO2: Implement and analyze the utilization of limited resources – manpower, time, money, space, equipment. – At optimum level.

CO3: Analyze the production line Productivity and Quality achievement to plan & implement process improvement activities

### **BFF3583 Elective: Industrial Ergonomics**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

CO1: Define the philosophy of ergonomics in industry based on human structure, function and behavior to perform work.

CO2: Design a good workspace based on best ergonomics practice.

CO3: Improve the current workspace considering the environments / surrounding factors.

CO4: Analyse the human-machine and human components of modern work systems.

### **BFF4573 Elective: Six Sigma**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

In this program, students will be able to use all tools, techniques and concepts learned in the Introduction program to solve a problem in a Six Sigma. Students will be doing a Six Sigma project and will experience Six Sigma deployment from Define phase until Control phase.

CO1: Analyze the collection of quantitative data pertaining to any subject or group when the data is systematically gathered and collated.

CO2: Analyze the quality improvement by using a control chart.

CO3: Analyze the various sampling systems in terms of lot by lot, continuous production, attributes and variables.

CO4: Develop a mathematical model as the solution for the problem.

### **BFF4663 Elective: Maintenance and Reliability**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces the concept and techniques used for planning and controlling all aspects of manufacturing.

CO1: Investigate the reliability estimation of a system and the components.

CO2: Build the likelihood function and adapt its use in the estimating of parameters of the failure time distributions.

CO3: Perform the preventive and scheduled maintenance as well as warranty policies according to reliability objectives.

### **BFF3593 Elective: Additive Manufacturing**

**Credit Hours: 3**

**Prerequisite: None**

**Synopsis**

This course introduces a wide range of available additive manufacturing (AM) technologies, design principles, materials and limitations such as extrusion-based deposition, binder jetting, sheet lamination, VAT photo polymerization, powder bed fusion, directed energy deposition and material jetting. The important aspect of design of additive manufacturing (DFAM), mechanical characteristics and material testing will be emphasized. For a practical application, students will execute industry related projects with a sound knowledge on the process of economics.

- CO1: Comprehend the importance, application technologies, design principles, and limitations of AM.  
 CO2: Analyse the mechanical characteristics of parts produced from AM.  
 CO3: Analyse the implication of various post-processing methods used in AM.  
 CO4: Execute industry related AM projects for the development of new products.

**BFF3523 Production Planning and Control****Credit Hours: 3****Prerequisite: None****Synopsis**

The course covers the topics of ERP, demand management, forecasting techniques, sales and operation planning, MPS, MRP, Capacity requirement planning, production activity control and scheduling techniques

- CO1: Apply forecasting models to develop forecasts for product demand, profits, sales, material requirements for a competitive advantage  
 CO2: Evaluate and analyze capacity planning, MPS and a resultant MRP for a complete production facility  
 CO3: Analyze production and inventory planning & control systems, and scheduling problems by using appropriate analytical skills and tools for a complete production facility

**BFF3622 Computer Aided Manufacturing****Credit Hours: 2****Prerequisite: BFF2612****Synopsis**

This course introduces students to a degree of competencies in the CAM principle, application, and integration that applied in the modern manufacturing system. Emphasizes will be given on the manual programming fundamentals and the application of various prismatic (2-axis) and surface (3-axis) machining strategies, through the selected computer assisted simulation software interface (CATIA).

- CO1: Demonstrate the principal, application and integration of the CAM system in the manufacturing.  
 CO2: Apply the fundamentals of manual part programming.  
 CO3: Analyze the machining parameters (machining strategy, geometry tools, feeds and speeds) using appropriate CAM software.  
 CO4: Demonstrate actual machining for various mechanical parts on the CNC machine in a teamwork.  
 CO5: Developing a group project as for effective and functional component output

**BFF3632 Design of Jigs & Fixtures****Credit Hours: 2****Prerequisite: BFF2612****Synopsis**

This course covers the importance of jigs and fixtures in industrial application. Several types of jigs and fixtures are introduced where emphasis is given to the function of locating, supporting, clamping and positioning as a requirement for all applications before the design of efficient and ergonomic jigs and fixtures is developed to improve productivity.

- CO1: Evaluate the importance of jigs and fixtures in industrial application for the improvement of production and quality.  
 CO2: Analyze a variety of jigs and fixtures and its applications considering the engineering factors.

CO3: Design jigs and fixtures using appropriate tools to improve productivity, efficiency and ergonomics.

### **BFF3801 Thermal-Fluid Engineering Lab**

**Credit Hours: 1**

**Prerequisite: BFF2233, BFF2223**

#### Synopsis

This course introduces the thermodynamics concepts and experimental approaches to verify approximate solutions of thermo fluid problems at conceptual design stage. The course covers three major chapters in thermo fluid engineering as follows: 1. Experimental measurements and analysis 2. Experimental techniques for engineering thermodynamics 3. Experimental technique for engineering fluid mechanics

CO1: Determine the accuracy of thermofluids measurement using uncertainty analysis

CO2: Analyze the experimental and analytical results for verification of thermofluid principles in a controlled experimental settings

CO3: Assess thermodynamic concepts in a varying experimental conditions

CO4: Characterize a thermofluid concept by initiating complex engineering problems.

### **BFF3906 Industrial Training**

**Credit Hours: 6**

**Prerequisite: Third year student and achieved “Kedudukan Baik (KB)” status on current evaluation.**

#### Synopsis

Students are required to undergo a minimum 10 weeks practical training in an industry or research area under industrial supervision. During this period, students will apply the knowledge and skills that they have learned. The hands-on experience will expose them to real engineering practice and prepare them to work in the manufacturing or related field in various industries upon graduation.

CO1: Suggest solutions to problems for related industry

CO2: Obey the rules and etiquettes in industry

CO3: Communicate effectively on industry experience

CO4: Function effectively as a member to supports the efforts of others

CO5: Search information in the broadest context of industrial experience

### **BFF3573 Product Design and Development**

**Credit Hours: 3**

**Prerequisite: BFF1343, BFF1801, BFF1502, BFF1811, BFF1123, BFF2612, BFF2003, BFF2423**

#### Synopsis

The course blends the perspective of marketing, design and manufacturing into a single approach to product development. It provides students of all kinds with an appreciation for the realities of industrial practice and for the complex and essential roles played by the various members of product development teams. The method provides a concrete approach to solve a product development problem.

CO1: Identify customer needs and product specifications by interpreting customer statement and developing needs-metrics matrix

CO2: Analyze concept generation, concept selection and concept testing to verify the customer needs have been adequately met by the product concept

CO3: Apply design for assemble and manufacturing (DFMA) to reduce manufacturing time and cost during the system-level and detail-design phases of the process

CO4: Communicate effectively to propose a product design and development project

### **BFF4653 Integrated Design Project**

**Credit Hours: 3**

**Prerequisite: BFF3573**

#### Synopsis

This course requires the students to design and develop a computer-controlled manufacturing machine as a product. It integrates the knowledge of software

programming; manufacturing processes planning and design; mechanical and electronic design. Students are required to design and develop a machine in a group as well as performing individual engineering roles in a multidisciplinary setting. The design and development are for providing a solution for complex engineering problems with consideration of health and safety, economy, productivity, quality, environmental and sustainability

- CO1: Construct product design requirement and produce relevant concept-to-final design specifications
- CO2: Produce concept design sketching, detail drawings with GDT & BOM, circuit drawings and programming flowchart
- CO3: Justify engineering design parameters and properties through engineering design calculation, finite element analysis and circuit analysis
- CO4: Develop detail manufacturing process planning including materials selection, tooling and process parameters
- CO5: Produce the product according to the proposed plan which includes the procurement, manufacturing, programming, assembly and testing
- CO6: Recommend potential improvement of the product design and manufacturing processes to reduce impact on environment and sustainability
- CO7: Exhibit effective engineering communication by producing design book and conduct an oral presentation of the product
- CO8: Display an active contribution as a member and leader of multidisciplinary team
- CO9: Manage the project using project management tools with consideration of financial and man-hour aspect of product development

### **BFF4533 Manufacturing Automation**

**Credit Hours: 3**

**Prerequisite: BFF3313**

#### Synopsis

This course introduces fundamental knowledge and skill of hydraulic and pneumatic systems for engineers. Both design

and development approaches will be used in this course. Students will be exposed to the Fundamental of Fluid Power; Pneumatic system; Hydraulic system and Programmable Logic Controller. Laboratory management and 5S implementation is essential for the lab session

- CO1: Analyse Pneumatic and Hydraulic system and its components
- CO2: Develop PLC program for automation system
- CO3: Design hydraulic / pneumatic system for mechatronics applications

### **BFF4103 Control System Engineering**

**Credit Hours: 3**

**Prerequisite: BFF3103**

#### Synopsis

This subject will cover the analysis of the system's stability and performance of the control system by using the time domain and frequency domain approaches. Conventional controllers such as PID controllers will be used to improve the transient and steady state performances in the time domain approach. In the frequency domain approach, the bode plot method will be utilised. The lead, lag and lead-lag compensators are introduced in improving the performance of the control system using the frequency approach.

- CO1: Analyze the transient response, system stability and state response for first and second order systems
- CO2: Design the PD, PI, PID, Lag, Lead and Lag-Lead compensator using root locus technique and frequency response technique.
- CO3: Design a PID control system project
- CO4: Communicate about the project effectively

### **BFF4902 Final Year Project 1**

**Credit Hours: 2**

**Prerequisite: Refer to PSM handbook (Has passed more than 90 Credit Hours)**

#### Synopsis

This course focuses on the investigative research oriented approach to engineering studies. Students are expected to develop

techniques in literature review, perform individual analysis and judgement and show capability of being assessed independently. The application of project management elements as a medium for conducting and integrating all expertise areas during the course is highly encouraged. Upon completion of this course students will proceed to Final Year Project 2 (FYP2) to fulfill the overall Final Year Project requirement.

- CO1: Formulate problem statement
- CO2: Review literature critically
- CO3: Propose research methodology
- CO4: Communicate on research work through report and presentation
- CO5: Demonstrate ethical principles based on norms of engineering practise
- CO6: Demonstrate project management principles according to engineering practise
- CO7: Conduct preliminary investigation based on the proposed research methodology.

### **BFF4911 Environment Safety & Health**

**Credit Hours: 1**

**Prerequisite: None**

#### Synopsis

This course covers the topics on industrial safety and health regulations, accident causation phenomenon, accident investigation, accident analysis, industrial hazard, industrial hygiene and managing safety and health.

- CO1: Explain the importance of environmental safety and health and OSHA regulations in workplace
- CO2: Analyse the practices in work places of employment contributing to serious possible damage to life, health and property.
- CO3: Develop a solution to the ESH problem in a given case study.

### **BFF4914 Final Year Project 2**

**Credit Hours: 4**

**Prerequisite: BFF4902 Refer to PSM handbook (Has passed more than 90 Credit Hours)**

#### Synopsis

This course is a continuation of the research work from FYP1. Students need to conduct an investigation based on the proposed research methodology. Students have to complete the course by submitting the thesis with formal presentation and a written report. Students will be assessed on the ability to work independently.

- CO1: Demonstrate understanding of fundamental and technical knowledge.
- CO2: Assess problems on relevant topics and develop its solution.
- CO3: Ability to engage in independent and life-long learning in the broadest context of literature review.
- CO4: Design and propose research methodology based on the given title.
- CO5: Conduct investigation based on the proposed research methodology.
- CO6: Communicate on project work through report and presentation.
- CO7: Apply ethical principles and commit responsibility in thesis writing.
- CO8: Produce and demonstrate project management according to engineering practice.
- CO9: Suggest recommendations for sustainable development.

## CURRICULUM STRUCTURE BACHELOR OF ENGINEERING TECHNOLOGY (MANUFACTURING) WITH HONOURS

YEAR SEMESTER	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
BACHELOR OF ENGINEERING TECHNOLOGY (MANUFACTURING) COURSES	BTM1614 Computer Aided Drafting	BTE1113 Electrical Fundamental	BTM1223 Engineering Dynamics	BTM2133 Metrology	BTM3143 Metal Fabrication Process	BTM3813 Engineering Tech. Senior Design Project 1	BTM4826 Engineering Tech. Senior Design Project 2	BTM4812 Industrial Training
	BTM1124 Machine Production Process	BTE1112 Electrical Fundamental Lab	BTM3324 Computer Aided Modelling	BTM2243 Fluid Power Technology	BTM3234 Manufacturing Computer Application	BTM3134 Manufacturing Component Design	BTM4514 Automated Manufacturing System	
	BTM1114 Basic Manufacturing Process	BTM1313 Statics	BTM2424 Strength of Materials	BTM3413 Industrial Quality Control	BTM3713 Lean Manufacturing System	BTM3514 Computer Integrated Manufacturing	BTM4783 Elective 1	
	BUM1113 Technical Mathematics	BT12413 Properties of Materials	BTM2233 Thermofluid	BTM3433 Engineering Economy	BTM3353 Programmable Logic Controller	BTM3364 Numerical Control System	BTM4723 Elective 2	
	UQ*1**1 Co-Curriculum 1	BUM1223 Calculus	BUM2113 Applied Mathematics	BUM2423 Applied Statistics	BTM3912 Engineering Ethics	BTM3533 Production Planning	BTM4773 Elective 3	
	UHL2400 Fundamentals of English Language	UQ*2**1 Co-Curriculum 2	UHS2011 Soft-Skills 2	UHL2432 English For Professional Communications	UGE2002 Technopreneurship			
	UHC1012 Falsafah Dan Isu Semasa	UHL2412 English For Academic Communications	UHL2432 English For Technical Communications		UHS1012 Soft-Skills 2			
	UHF1111 Foreign Language 1	UHC2022 Penghormatan Etika Dan Peradaban						
		UHF2041 Foreign Language 2						
	142	19	20	18	17	19	18	19
OVERALL TOTAL CREDIT FOR GRADUATION								

**ELECTIVE COURSES FOR  
BACHELOR OF ENGINEERING TECHNOLOGY (MANUFACTURING) WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BTM4773	Work Measurement	3
2	BTM4723	Advanced Manufacturing Process	3
3	BTM4783	Safety and Ergonomics	3
TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION			9

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	To produce engineering technologists with mastery of the needed expertise in manufacturing industries using the foundation of technology and innovation.
PEO2	To prepare engineering technologists that demonstrate skills of lifelong learning for professional and personal development
PEO3	To prepare engineering technologists with good management skill, good professional ethics and understanding local law in manufacturing issues
PEO4	To prepare global engineering technologists that work and communicate effectively in multinational and multidisciplinary engineering community.

PROGRAMME OUTCOMES (PO)	
PO1	Apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to define and manufacturing engineering technology procedures, processes, systems or methodologies
PO2	Solve broadly-defined engineering technology problems systematically to reach substantiated conclusions by using tools and techniques appropriate to manufacturing engineering technology field
PO3	Design solutions for broadly-defined manufacturing engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Plan and conduct experimental investigations of broadly-defined problems using data from relevant sources
PO5	Select and apply appropriate techniques, resources and modern engineering technology tools, with an understanding of their limitations
PO6	Function effectively as individuals, and as members or leaders in diverse technical teams.
PO7	Communicate effectively with the engineering community and society at large.
PO8	Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
PO9	Demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO10	Demonstrate an awareness of management, business practices and entrepreneurship
PO11	Demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.
PO12	Recognize the need for professional development and to engage in independent and lifelong learning



## **COURSE SYNOPSIS FOR DEGREE PROGRAMME 2022/2023**

### **BACHELOR OF ENGINEERING TECHNOLOGY (MANUFACTURING) WITH HONOURS**

#### **BTM1114 Basic Manufacturing Process**

**Credit Hours: 4**

**Prerequisites: None**

#### Synopsis

This course intended to introduce materials, techniques, and equipment of industrial manufacturing. Emphasis on laboratory demonstration and simulation activities such as machining, welding, casting, and forming operations.

- CO1: Explain the structure and properties of basic engineering materials and their relationship to manufacturing.
- CO2: Describe the fundamental equipment and processes employed in common manufacturing operations.
- CO3: Identify process parameters and how they affect the manufacturing processes.

#### **BTM1614 Computer Aided Drafting**

**Credit Hours: 4**

**Prerequisites: None**

#### Synopsis

This subject is to introduce to the students the principle of computer-aided design. Topics includes Drafting Overdesigned review, Drawing Set-up , Basic CAD ,Commands Geometric Construction , Orthographic Projection , Basic Drawing ,Tools, Pictorial Drawings, Sectional Views, Advance CAD Commands, Modifying CAD, Drawings, Dimensioning, Tolerances, Working Drawings, Threads and Fasteners

- CO1: Analyze problem in technical drawing and understand drawing

- CO2: Use basic geometric construction techniques to create objects in CAD
- CO3: Project a 3 dimensional object in 2 dimensional space with the proper utilization of views in CAD
- CO4: Read & create dimensioned drawings using conventional techniques in CAD.
- CO5: Identify and understand the components of working drawings & the standards that apply.

#### **BTM1124 Machine Production Processes**

**Credit Hours: 4**

**Prerequisites: None**

#### Synopsis

This course intends to provide detailed study of traditional and contemporary methods of metal machining. Laboratory experience includes the fundamentals of machine tool setup and operation, precision measurement techniques, and machine tool safety, care and maintenance.

- CO1: Develop basic machine tool processing knowledge, abilities and skills.
- CO2: Expand machine tool processing knowledge, abilities and skills through experience with traditional processes.
- CO3: Complete assigned projects as directed within safety, planning and specifications consistent with items above.
- CO4: Demonstrate understanding of function and application of processes through examination and discussion and operation.
- CO5: Provide study and understanding of nontraditional processes in manufacturing.

#### **BTE1112 Electrical Fundamentals Laboratory**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course introduces students to the fundamentals laboratory of DC and AC circuits and basic network laws and theorems. The students will be handling the basic measurement equipment to measure and analyse the parameter of the electrical circuits.

- CO1: Construct simple electrical and electronics and simulate the operation of the circuits using circuit simulation software (OrCAD).
- CO2: Measure parameter of electrical circuits (resistance, voltage, current, etc)
- CO3: Work ethically and effectively as an individual and in a group

### **BTE1113 Electrical Fundamentals**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This module will introduce students to basic science of electricity, introduction to instrumentation and measurement, work and energy theorem, basic electrical circuits and introduction to magnetism.

- CO1: Describe the basic concept of electricity, conductors, insulators, circuit, magnetism and other devices.
- CO2: Apply basic electrical laws such as Ohm and Kirchhoff Law to solve circuit or electrical problems.
- CO3: Shows the ability to communicate effectively.

### **BTM1313 Statics**

**Credit Hours: 3**

**Prerequisites:**

#### Synopsis

This course introduces force vector algebra, equilibrium of forces on particles, equilibrium

of forces on single rigid body and force analysis on simple frames and machine structures (multi-rigid bodies) and problems involving dry friction.

- CO1: Perform force vector algebra – resultant of forces, cross product, dot product and mixed triple product of forces.
- CO2: Solve equilibrium of forces on particle problems
- CO3: Solve equilibrium of forces on single rigid body problems
- CO4: Solve equilibrium of forces on simple frame and machine structure problems.
- CO5: Solve problems involving dry friction.

### **BTM1223 Engineering Dynamics**

**Credit Hours: 3**

**Prerequisites: BTM1313, BUM1113, BUM1223**

#### Synopsis

This course intended to introduce the basic principles including friction and motion of a point in both one and two dimensions, as well as rigid body motion.

- CO1: Ability to understand and apply properties of friction.
- CO2: Ability to determine velocity and acceleration of a given particle in one and two dimensions.
- CO3: Ability to determine rectilinear and curvilinear motion.
- CO4: Ability to determine angular and linear velocity and acceleration.
- CO5: Ability to apply acceleration and velocity concepts to rigid body motion.

### **BTM3234 Manufacturing Computer Application**

**Credit Hours: 4**

**Prerequisites: None**

#### Synopsis

Overview of computer hardware, software, and processing concepts related to the control of manufacturing tasks. Emphasis on use of integrated software packages in the solution of a variety of manufacturing problems. Laboratory assignments in automation control, real time data sampling, and creation of user interfaces.

CO1: Apply software development for technology problem solving.

CO2: Perform adaptive programming skills for a more diverse application environment.

### **BTM3912 Engineering Ethics**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This subject gives an overview of engineering, the profession and its requirements in Malaysia scenario. Topics that will include ethics, management and contribution of engineering also generic skills and study skills. Moreover, this subject can enhance students' knowledge about the obligations of engineers/technologists to the clients, professionals and society, ethical codes, safety codes.

CO1: Explain Engineering ethics, management and contribution.

CO2: Analyze and comprehend the indispensable ethics, professionalism, responsibility, skills of teamwork and leadership

CO3: Justify systematic approach to the ethical issue in the industry and engineering field

### **BTV3433 Engineering Economy**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course introduces the concept of life cycle cost, interest and equivalent. Formula and factors for single and multiple cash flow. Method for investment assessment and alternative comparison and project evaluation using cost worth ratio, inflation and cash flow method.

CO1: Analyze the engineering cost concept.

CO2: Analyze the return to capital

CO3: Analyze the money-time relationship

CO4: Analyze the depreciation of the asset

CO5: Analyze the cost estimation and project evaluation

### **BTM2243 Fluid Power Technology**

**Credit Hours: 3**

**Prerequisites: BTM2233**

#### Synopsis

This subject is designed to introduce to the students the principle of fluid mechanics. Topics includes stress and strain rate descriptions, fluid statics, use of differential and finite control volume analysis with continuity, momentum, and energy equations, Bernoulli and Euler equations, vorticity, potential flow, incompressible viscous flow using Navier-Stokes equations, dimensional analysis, pipe flow, boundary layers, separation, introduction to turbulence.

CO1: Understanding of fluid mechanics fundamentals, including concepts of mass and momentum conservation.

CO2: Apply the Bernoulli equation to solve problems in fluid mechanics.

CO3: Apply control volume analysis to problems in fluid mechanics.

CO4: Use potential flow theory to solve problems in fluid mechanics.

CO5: Perform dimensional analysis for problems in fluid mechanics

### **BTM1413 Properties of Materials**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course intends to provide a comprehensive introduction to the different classes of industrial materials, their structure, properties and industrial uses. The purpose of this course is to introduce the student to a wide range of engineering materials, which are important to industry. Such knowledge will be useful to make an intelligent selection of materials for a variety of commercial applications based on an understanding of properties, test methods and processes.

- CO1: Knowledge of fundamental structure of materials.
- CO2: Understanding of material properties.
- CO3: Knowledge of material processing by casting and forging.
- CO4: Solve the stress and strain in structural members' subjected combined loads.

### **BTM2424 Strength of Materials**

**Credit Hours: 4**

**Prerequisites: BTM1313, BUM1223**

#### Synopsis

This course intends to provide mechanics of deformable bodies with emphasis on principles of stress and strain, shear and bending moment, torsion, buckling, failure criteria and design concepts.

- CO1: Determine axial and bending stress and strain as well as torsional stress and strain and Hookes law.
- CO2: Determine material properties and principal stresses both theoretically and experimentally
- CO3: Utilize mathematics and physics properties in solving complex stress / strain problems.
- CO4: Utilize stress and strain information in designing tasks.

### **BTM2233 Thermofluids**

**Credit Hours: 3**

### **Prerequisites: None**

#### Synopsis

This course is designed to give the student the ability to analyze many practical problems in which fluid is the working medium. Basics of Thermodynamics and heat transfer in its three different modes; conduction, convection and radiation, are also introduced. This is to enable the student to analyze simple thermal systems and cycles.

- CO1: Apply fluid and thermal fundamental concepts and equations to analyse problems.
- CO2: Construct an experiment to understand the fundamental concept.
- CO3: Demonstrate life-long learning skills during discussion or completing assignments.

### **BTM2133 Metrology**

**Credit Hours: 3**

**Prerequisites: BTM1114**

#### Synopsis

This course covers precision dimensional measurement techniques including laboratory experience with optical, electronic, and mechanical comparators, light wave measuring devices, use of precision gage blocks, and surface finish analysis.

- CO1: Develop an understanding of measurement theory and systems
- CO2: Use geometric or dimensional features of products or parts to be measured or inspected.
- CO3: Plan and perform measurements of products or parts and calibration of instruments at specified levels of accuracy.
- CO4: Identify measurement acts and techniques.

### **BTV3413 Industrial Quality Control**

**Credit Hours: 3**

**Prerequisites: None**

## Synopsis

Techniques of establishing and maintaining quality of product including statistical quality control applications.

- CO1: Analyze the productivity in an organization by using productivity concepts and fundamentals.
- CO2: Select layout design based on layout design procedure location and basic layout design by taking into account the impact of sustainable environment
- CO3: Analyze production planning, control and inventory management activities based on given cases.
- CO4: Evaluate solutions for a given case based on total quality management systems, quality control concept ISO 17001.

**BTM4743 Advanced Manufacturing Process**  
**Credit Hours: 3**  
**Prerequisites: BTM1114**

## Synopsis

This course is designed to provide students with an introduction to industrial manufacturing systems by having them engage in selected activities essential for modern manufacturing. Manufacturing systems, tools, and processes are studied as they are applied to producing products. Laboratory experiences cover manufacturing systems emphasizing tooling design, automated manufacturing, and control systems. Includes laboratory activities.

- CO1: Discuss the importance and characteristics of manufacturing technology.
- CO2: Conduct scholarly research that thoroughly presents and critically

analyzes a manufacturing system or topic.

- CO3: Apply sound principles of manufacturing engineering to solve problems related to manufacturing.
- CO4: Develop programming to control a variety of automated manufacturing equipment.
- CO5: Fabricate products using advanced manufacturing and design equipment.

**BTM3134 Manufacturing Component Design**  
**Credit Hours: 3**  
**Prerequisites: BTM2623**

## Synopsis

Design of motion components for the manufacturing industry. Includes CAD techniques to study solid modeling and manufacturing components such as gears, cams, and linkages, and their application.

- CO1: Design parts using solid modeling and identify downstream applications.
- CO2: Apply parametric solid modeling techniques in component design.
- CO3: Perform design skills in the usage of Solid Works software.
- CO4: Able to determine position, acceleration and velocity for a 4-bar mechanism.
- CO4: Able to analyze compound and epicyclic gear trains and design and analyze cams.

**BTM3353 Programmable Logic Controllers**  
**Credit Hours: 3**  
**Prerequisites: None**

## Synopsis

This subject is designed to introduce to the students the principle of programmable logic controllers. This subject emphasizes basic concepts and skills needed to program and

apply programmable electronic controllers in industry. Man Machine Interface (MMI) and Supervisory Data Acquisition (SCADA) systems will be examined. Experiments in operation, programming, and industrial applications.

- CO1: Identify and define functions of hardware components of programmable logic controllers.
- CO2: Distinguish between different types and architectures of PLC's and their applications.
- CO3: Demonstrate proficiency in ladder logic by applying programming skills to implement industrial applications.
- CO4: Identify problems in industrial applications requiring PLC's by troubleshooting hardware and software.

### **BTM3334 CNC Machining**

**Credit Hours: 4**

**Prerequisites: BTM1124; BTM2623**

#### Synopsis

This subject is designed to introduce to the students numerical control systems. Topics include Principle of CNC part programming, tooling and work-holding devices, machine tool position and motion control systems, automatic tool changers and machining centres, kinematics and mechanics of milling operations, part programming using CAD/CAM systems.

- CO1: Write fundamental manual G-code programs, for various machining applications, including spindle speeds, and feed rates.
- CO2: Program absolute and incremental tool positions for machining canned cycle operations, linear and circular interpolation, looping and subroutine.
- CO3: Use a PC to prepare, edit and print a machine readable part program and use a CNC machine to verify and machine a basic part.

- CO4: Use 2D CAM software to create job operation files, 2D shape profiles, generate machine code, verify tool path using computer simulation, and machine basic parts on a CNC machine using computer generated code.

### **BTM3813 Engineering Technology Senior Design Project I**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course is designed to expose the students to a senior design project. They have to apply all the knowledge that they have learned in the programme to complete the senior design project. Each student will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor). During the senior design project I, the students will be able to do a literature survey and prepare a draft which contains the objective of the project, problem statement, literature survey, solving techniques, methodology, and expected result, treatment of results and list of reference publications. At the end of this subject, the students are required to present the draft in a short seminar which will be evaluated by a faculty's panel.

- CO1: Propose background study, problem statement, objective and scopes of the research
- CO2: Practice positive attitude in research activities
- CO3: Present the research proposal and cited latest publications on the subject

### **BTM3514 Computer Integrated Manufacturing**

**Credit Hours:4**

**Prerequisites: None**

#### Synopsis

Three basic themes will be stressed throughout the course. First, developing manufacturing strategy involves considering factors beyond the traditional boundaries of the manufacturing function. Such factors include the overall competitive position of the firm, the nature of market demand, competitor's actions, government regulations, and so on. Second, there is a strong linkage between a firm's competitive strategy and its manufacturing strategy. If this linkage is maintained, operations can become a formidable competitive weapon. If this linkage is neglected, even the best-designed strategies can fail. Finally, the course will consider manufacturing strategy issues in an integrative manner by developing the interrelationship between operations, finance, accounting, and marketing.

- CO1: List components of a computerized integrated manufacturing environment.
- CO2: Explain various automation techniques currently used in industry.
- CO3: Develop a systematic plan for manufacturing strategy implementation
- CO4: Develop a systematic plan for manufacturing strategy implementation required for a selected product.
- CO5: Model enterprise manufacturing and automation strategies that respond to national and global manufacturing demands.

### **BTM3134 Metal Fabrication Process**

**Credit Hours: 4**

**Prerequisites: BTM1614; BTM1114**

#### Synopsis

This course introduces students about the metal fabrication process from the materials, techniques and equipment of joining and welding process. Emphasis on laboratory demonstration and simulation activities focuses on different types of welding such as

SMAW, GMAW, GTAW and others. It also includes a quality management system in welding and defect detection.

- CO1: Discuss the various metal fabrication processes used in industry.
- CO2: Distinguish between types of metals and suitable joining processes and procedures for the various metals.
- CO3: Demonstrate common welding and other joining and cutting processes used in metal fabrication.
- CO4: Classify techniques utilized for testing the integrity of fabrications.

### **BTM3533 Production Planning**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

Analysis, design, and management of production systems. Topics include productivity measurement, forecasting techniques, project planning, inventory systems, aggregate planning, master scheduling, operations scheduling, and operational research.

- CO1: Explain the principle of production control and planning.
- CO2: Describe the elements in production planning
- CO3: Design the scheduling in production
- CO4: Apply the techniques of Operational Research in Production

### **BTM3713 Lean Manufacturing System**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

Introduction to modern issues in lean manufacturing systems and practice of lean tools. Topics include overview of lean manufacturing systems, quick changeover,

total productive maintenance, pull/ just-in-time/ kanban, cellular manufacturing, kaizen, wastes identification, productivity measurement, plant layout, and line balance. At the end of the semester the students should have a basic understanding of the design, operation and control of lean manufacturing systems and be able to use quantitative methods to model, analyze, and optimize such systems.

- CO1: Identify the seven types of waste in a manufacturing company.  
 CO2: Evaluate lean production tools and techniques in Lean manufacturing system in a production line  
 CO3: Perform the evaluation techniques to measure productivity in lean manufacturing activities.

**BTM4826 Engineering Technology Senior Design Project II**  
**Credit Hours: 6**  
**Prerequisites: BTM3813**

**Synopsis**

This subject is the continuation of the subject Engineering Technology Senior Design Project I. In this course, the students are required to conduct the research, collect and analyze data, discuss the findings and form the conclusions. At the end of the semester, the students are required to produce a design project report and present it to the faculty's evaluation panel.

- CO1: Analyze data, discuss and conclude the findings.  
 CO2: Manage the research work.  
 CO3: Practice positive attitude in research activities.  
 CO4: Present the research report cited the latest publications on the subject.

**BTM4919 Industrial Training**  
**Credit Hours: 9**  
**Prerequisites: Passed All Courses**

**Synopsis**

In Industrial Training the students should gain insight into industrial practice, in order to visualize the tasks and possibilities of their later occupation work. All students are required to undergo industrial training for a certain period that has been agreed by the faculty during the last semester of the academic year. The performance of each student during the periods of his/her industrial training is evaluated by the faculty staff, and the representatives from employer organizations.

- CO1: Show and classify in-depth the industrial structure and organization and to understand roles of typical personnel in that particular industry.  
 CO2: Manipulate the knowledge learned in the university and to practice them in problem solving direct or indirect application to any design, planning, production or management  
 CO3: Practice the professionalism and work etiquette that comply with good and responsible engineers.  
 CO4: Demonstrate management/ leadership skills to lead or manage effectively in an industry environment.  
 CO5: Demonstrate the knowledge and ability to search and retrieve information and materials related to the industrial needs.

**ELECTIVE COURSES**

**BTM4783 Safety and Ergonomics (Elective 1)**  
**Credit Hours: 3**  
**Prerequisites: None**

**Synopsis**

This course provides a foundation for understanding the key concepts and principles related to ergonomics. The aim of ergonomics in industry is to increase productivity, and decrease accidents and illnesses by obtaining a good fit between the employer and the job. This course also examines the relationships between employer, work equipment and work environment. Case studies are also used to



test students' current knowledge and understanding of the way complex systems are designed and used.

- CO1: Evaluate occurrence of failing to consider ergonomics design procedure.
- CO2: Conduct risk measurement associated with ergonomics.
- CO3: Adapt best ergonomics practices to solve ergonomics problems that arise from work practices and environment.

**BTM4723 Advanced Manufacturing Process (Elective 2)**  
**Credit Hours: 3**  
**Prerequisites: BTM1114**

Synopsis

This course intends to provide in depth knowledge of the types of advanced manufacturing and machining processes (AMPs); evolution, and need. In this course students will study the fundamentals and advanced techniques related to manufacturing processes. In addition to the applied aspects of manufacturing processes, a sound analytical basis for some of the processes will be taught. Through the use of analytical approaches in conjunction with laboratory practical's students will learn how to control a manufacturing process for optimal production. This course will build a foundation of capability for the solution, analysis and synthesis of a wide variety of manufacturing problems

- CO1: Explain the details of types of advanced manufacturing and machining processes, their evolution and need.
- CO 2: Identify the correct advanced manufacturing processes by formulating and determining the correct AMPs for development of various complex shaped geometries.
- CO3: Hands-on experiments on the Advanced Machines such as EDM, WEDM etc.
- CO4: Design and development of experimental apparatus of any one

advanced or derived and hybrid manufacturing process (Team Project). Perform good workplace ethics in completing assigned projects as directed.

**BTM4773 Work Measurement (Elective 3)**  
**Credit Hours: 3**  
**Prerequisites: BTM3713**

Synopsis

Expose to the students the techniques for improving and standardizing methods, procedures for measuring work and developing time standards in production and service activities, the importance of motion and time study in the lean manufacturing environment. The techniques to analyse operations and tasks of the current process using the established motion and time study and to create motion and time study data also will be introduced.

- CO1: Explain the importance of motion and time study in the lean manufacturing environment
- CO2: Analyse operations and tasks of the current process using the established motion and time study techniques.
- CO3: Create motion and time study data using the established techniques.
- CO4: Develop improved processes and explain the benefits of the improved process using the motion and time study data.

## CURRICULUM STRUCTURE BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (INDUSTRIAL AUTOMATION) WITH HONOURS

YEAR SEMESTER	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (INDUSTRIAL AUTOMATION) COURSES	BT11112 Engineering Materials	BT11323 Thermodynamics	BT12223 Strength of Materials	BT12121 Materials Lab	BT13523 Sensor and Instrumentation Systems	BT13623 Capstone	BT14710 Final Year Project	
	BT11212 Statics	BT11523 Electrical and Electronics	BT12412 Computer Aided Engineering and Manufacturing	BT12123 Project Management Eng. Economy	BT13603 Control Systems Engineering	BT13403 Introduction to Machine Learning	BT14122 Professional Practice & Ethics	
	BT11413 Computer Aided Design	BT11122 Industrial Quality Control	BT12213 Dynamics	BT12622 Microcontroller	BT11423 Programming for Eng. Technologists	BT13822 Internship Preparation	BT14113 Occupational Safety and Health	
	BT11133 Manufacturing Processes	BT11423 Programming	BT12313 Fluid Mechanics	BT13513 Digital Electronics	BTX3612 Industrial IoT	BT13503 Electrical Drive System	BT13122 Fundamental of IR4.0	BT14812 Industrial Training
	UQB**1 Co-Curriculum 1	BUM1223 Calculus	BUM2113 Applied Mathematics	BTX2643 Robotic System Modelling	BT12623 Industrial Automation	BT* 3**3 Elective 3		
	UHL2400 Fundamentals of English Language	UHF1111 Foreign Language 1	UGE2002 Technopreneurs hip	BUM2423 Applied Statistics	BT* 3**3 Elective 1	BT* 3**3 Elective 4		
	BUM1113 Technical Mathematics	UQ*2**1 Co-Curriculum 2	UHF2041 Foreign Language 2	UHC1012 Falsafah dan Isu Semasa	BT* 3**3 Elective 2			
	UHS1022 Soft-Skills	UHL2432 English For Technical Communications		UHL2432 English For Professional Communications				UHC2022 Penghayatan Etika dan Peradaban
	UHL2412 English For Academic Communications							
	140	18	18	17	19	19	19	17
OVERALL TOTAL CREDIT FOR GRADUATION								

**ELECTIVE COURSES FOR  
BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY  
(INDUSTRIAL AUTOMATION) WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BTX3523	Autonomous Robotic System	3
2	BTI3413	Applied Machine Learning	3
3	BTI3823	Automated Manufacturing Systems	3
4	BTI3423	Machine Vision	3
<b>TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION</b>			<b>12</b>

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	To produce engineering technologists with mastery of the needed expertise in manufacturing industries using the foundation of technology and innovation.
PEO2	To prepare engineering technologists that demonstrate skills of lifelong learning for professional and personal development
PEO3	To prepare engineering technologists with good management skill, good professional ethics and understanding local law in manufacturing issues
PEO4	To prepare global engineering technologists that work and communicate effectively in multinational and multidisciplinary engineering community.

PROGRAMME OUTCOMES (PO)	
PO1	Apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to define and manufacturing engineering technology procedures, processes, systems or methodologies
PO2	Solve broadly-defined engineering technology problems systematically to reach substantiated conclusions by using tools and techniques appropriate to manufacturing engineering technology field.
PO3	Design solutions for broadly-defined manufacturing engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Plan and conduct experimental investigations of broadly-defined problems using data from relevant sources
PO5	Select and apply appropriate techniques, resources and modern engineering technology tools, with an understanding of their limitations
PO6	Function effectively as individuals, and as members or leaders in diverse technical teams.
PO7	Communicate effectively with the engineering community and society at large.
PO8	Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
PO9	Demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO10	Demonstrate an awareness of management, business practices and entrepreneurship
PO11	Demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.
PO12	Recognize the need for professional development and to engage in independent and lifelong learning

## **COURSE SYNOPSIS FOR DEGREE PROGRAMME 2022/2023**

### **BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (INDUSTRIAL AUTOMATION) WITH HONOURS**

#### **BTI1112 Engineering Materials**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course introduces the different materials used in engineering applications and their respective characteristics and properties. This knowledge is quite necessary for a person working in the manufacturing field to select proper material for engineering applications and selection of appropriate manufacturing process for the material selected.

By the end of semester, students should be able to:

- CO1: Recognise basic knowledge on engineering materials and their physical and mechanical properties.
- CO2: Develop a solution for problems in selection of material for different applications based on their properties.
- CO3: Demonstrate the understanding of material properties to select proper material for general engineering applications through projects and assignments.

#### **BTI1212 Statics**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course introduces the force vector algebra, equilibrium of forces on particles, equilibrium of forces on single rigid bodies and simple force analysis on simple frames and machine structures (multi-rigid bodies) and problems involving dry friction.

By the end of semester, students should be able to:

- CO1: Compute equilibrium of forces on particle problems
- CO2: Analyze equilibrium of forces on single rigid body problems.
- CO3: Identify equilibrium of forces on simple frame structure problems using computer aided force analysis programs.

#### **BTI1413 Computer Aided Design**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

The course presents the integration of Computer Aided Design and Drafting systems. By combining multiple methods for construction of the 2D drafting, creation of 3D solid / surface design model and 3D assembly, students should be able to prepare detailed documentation of engineering drawing and bill of material (BOM) according to industrial standards. Emphasizes will also be given on proper dimensioning techniques, identifying critical dimensions and tolerances for assembly parts and Geometric Dimensioning and Tolerancing (GD&T).

By the end of semester, students should be able to:

- CO1: Comprehend standard procedures in sketching and technical drawing.
- CO2: Develop standard drawing package consists of 2D assembly drawing, parts list and detailed part drawing.
- CO3: Apply the knowledge of geometric modeling concepts used in commercial CAD/CAM software
- CO4: Construct 3D parts, assembly models and drafting according to the engineering standards

#### **BTI1133 Manufacturing Processes**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course introduces various challenges and issues in modern manufacturing process

and operations, ranging from traditional topics such as casting, forming, machining and joining process

By the end of semester, students should be able to:

- CO1: Identify the manufacturing process of metal casting, forming and shaping, joining and surface technology.
- CO2: Classify the processing parameters of metal casting, forming, joining, and surface technology
- CO3: Propose a design of manufacturing process system that can be used in production that can contribute to public health and safety, cultural, societal, environmental and sustainability
- CO4: Recommend an optimized process parameters of a manufacturing process using research methods.

### **BTI1523 Electrical and Electronics**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This module will introduce students to basic science of electricity, introduction to instrumentation and measurement, work and energy theorem, basic electrical circuits and introduction to magnetism.

By the end of semester, students should be able to:

- CO1: Analyze the basic concept of electricity, semiconductor and transistor configuration in AC and DC conditions.
- CO2: Apply basic electrical and electronic laws to solve circuit problems.
- CO3: Demonstrate understanding effectively in written assignments related to electrical and electronic principles.

### **BTI1423 Programming**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course introduces the basics of the C programming language. The contents of this course includes coding input and output, variables, constants, arithmetic operations, mathematical functions, user defined functions, loops, selection making decision and repetitive construct, array, and also data structure.

By the end of semester, students should be able to:

- CO1: Solve a mathematical problem using variables, constants, arithmetic operations, mathematical functions and user-defined functions with the correct rules.
- CO2: Organizes the flow of a program that uses decision making, repetition and loop statements without any errors.
- CO3: Assemble a program code that is related to mechatronics applications that follows a design specification.
- CO4: Manipulate the handling of arrays in a program to ensure correct calculated output is produced

### **BTI1122 Industrial Quality Control**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course introduces fundamental concepts and principles of quality and continuous improvement in manufacturing and service industries, developed by the various quality gurus (Deming, Juran, Feigenbaum, Ishikawa etc.). The use of control charts and statistical tools to determine stability and capability of processes to produce quality products. Defining and quantifying the various forms of quality costs.

By the end of semester, students should be able to:

- CO1: Planning the implementation of the principles of quality control and continuous improvement to ensure customer satisfaction and global competitiveness.

- CO2: Analysing the various quality costs in industrial processes and implementing appropriate quality management tools to eliminate the same.
- CO3: Engage in independent and lifelong learning about industrial quality control and continuous improvement.

**BTI1323 Thermodynamics**  
**Credit Hours: 3**  
**Prerequisites: None**

Synopsis

This course is designed to give the student the ability to analyze many practical problems in which fluid is the working medium. Basics of Thermodynamics and heat transfer in its three different modes; conduction, convection and radiation, are also introduced. This is to enable the student to analyze simple thermal systems and cycles.

By the end of semester, students should be able to:

- CO1: Apply thermodynamics fundamental concepts and equations to analyse problems related with the first law of thermodynamics.
- CO2: Solve problems related to the second law of thermodynamics power cycles.
- CO3: Construct experiment to understand the fundamental concept of thermodynamics

**BTI2223 Strength of Materials**  
**Credit Hours: 3**  
**Prerequisites: BTI1212**

Synopsis

This course intends to provide mechanics of deformable bodies with emphasis on principles of stress and strain, shear and bending moment, torsion, buckling, failure criteria and design concepts.

By the end of semester, students should be able to:

- CO1: Perform stress analysis on a structure subject to axial loading and torsion.
- CO2: Design and analyse a beam subject to pure bending and shear stress.
- CO3: Perform stress and strain transformation to find principal stresses and strain.

**BTI2412 Computer Aided Engineering and Manufacturing**  
**Credit Hours: 2**  
**Prerequisites: None**

Synopsis

This course introduces students to develop a degree of competencies in the CAM principle, application, and integration that applied in the modern manufacturing system. Students will analyze structural stress and dynamics problems of a component or assembly using finite element method (FEM) . Students also optimized 2-axis and 3-axis milling tool path strategies and parameters using computer-assisted simulation software with a sound knowledge of machining accuracy, cost and efficiency. Finally, for a practical application, students execute NC code generation /editing, transferring of NC code to the CNC machine and run the program.

By the end of semester, students should be able to:

- CO1: Demonstrate the principal, application and integration of the CAM system in the manufacturing.
- CO2: Perform FEM of structural stress and dynamics problem using computer simulation software
- CO3: Write manual programming for CNC milling and CNC lathe
- CO4: Manipulate 2-axis and 3-axis milling tool path strategies with appropriate input of machining parameters and concern of machining accuracy, cost and efficiency using computer simulation software.
- CO5: Demonstrate actual machining for various mechanical parts on the CNC machine in a teamwork.

**BTI2213 Dynamics**  
**Credit Hours: 3**  
**Prerequisites: None**

Synopsis

This course intends to apply the knowledge of basic principles of engineering dynamics including kinetics and kinematics motion of a point in both one and two dimensions, velocity in 1-D and 2-D and break down into components, methods of energy and momentum, Newton's laws of motion, vectors components and magnitudes as well as rigid body motion.

By the end of semester, students should be able to:

- CO1: Solve kinematic and kinetic problems for particles, systems of particles and rigid bodies.
- CO2: Explain momentum and energy methods problems for particles, systems of particles and rigid bodies.
- CO3: Design as a team a case study/laboratory experiment related to principles of dynamics.

**BTI2313 Fluid Mechanics**  
**Credit Hours: 3**  
**Prerequisites: None**

Synopsis

This course is designed to give the student the exposure on the properties of fluids, laws of fluid mechanics and energy relationships for incompressible fluids. The main context related to the flow system in closed conduits, including pressure loss, flow measurement, pipe sizing and pump selection are included.

By the end of semester, students should be able to:

- CO1: Apply fluid mechanics fundamental concepts and equations to analyse problems.
- CO2: Solve problems related to fluid mechanic systems by applying thermodynamic laws and fluid principles.

- CO3: Construct an experiment to understand the fundamental concept of fluid mechanics.

**BTI2121 Materials Lab**  
**Credit Hours: 1**  
**Prerequisites: None**

Synopsis

This lab introduces principles of engineering and solid mechanics through practical experiments. The covered areas are for principles of statics, dynamic and mechanics of materials.

By the end of semester, students should be able to:

- CO1: Analyze engineering mechanics problems for a rigid body at rest and in motion.
- CO2: Examine mechanical properties of engineering structures.
- CO3: Apply ethical principles and commitments of professional ethics on lab practices

**BTI3513 Digital Electronics**  
**Credit Hours: 3**  
**Prerequisites: None**

Synopsis

This course is designed to introduce the basic principle of digital systems and digital circuit design with analysis. Lecture and tutorial will cover the following: Algebra Boolean, Numbering System, Basic Logic Gate, Combinational Logic Circuit Design, Bi-stable Memory Devices and Sequential Circuits Design.

By the end of semester, students should be able to:

- CO1: Apply numbering system, digital codes and digital component in digital electronics
- CO2: Analyze combinational logic circuits in digital system

- CO3: Analyze sequential logic circuits in digital system
- CO4: Demonstrate the simulation of a digital system using computer aided design tool

### **BTI2123 Project Management and Engineering Economy**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course embraces a broad basic overview and principles of project management which has become central to operations in manufacturing enterprises throughout five stages of managing project; initialization, planning, execution, control and closing. By the end of semester, students should be able to:

- CO1: Prepare a project charter which describes a preliminary framework of project's goal, scopes, high level deliverables and initial project evaluations.
- CO2: Develop a project planning using management tools, cost concepts and design economics.
- CO3: Demonstrate task scheduling using an ordered sequence of activities with time allotted.
- CO4: Perform actual performance at any of project duration.

### **BTI2622 Microcontroller**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course is an introduction to microcontroller systems and embedded devices. Students are exposed to microcontroller architecture, peripherals, and subsystems. These include processing unit, registers, memory, internal data flow, I/O, timer, PWM, Analog Digital Converter, interrupt, serial communication, Master-Slave configuration. By the end of semester, students should be

able to:

- CO1: Demonstrate microcontroller's principle of the work and its architecture.
- CO2: Assemble microcontroller program with its peripherals and subsystem in simulation and hardware.
- CO3: Develop a solution for engineering problems using microcontrollers.
- CO4: Discuss effectively in group works, presentations, and reports.

### **BTI2623 Industrial Automation**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

In this course, students will be exposed to automation and machinery concepts and terminology as used in the industry. The fundamental knowledge learned during the previous years will be combined and applied to the context of automation and machinery. The students will be tested for their understanding of the concepts and terminologies, and will be required to develop, document, and present an industrial automation solution for a test case manufacturing system.

By the end of semester, students should be able to:

- CO1: Understand specific applications and functions related to automation.
- CO2: Develop a solution for an industrial automation problem.
- CO3: Program and use the automation device of machine control systems.

### **BTX2643 Robotic System Modelling**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course provides an overview of robot mechanism, kinematics, motion kinematic, dynamics and planning control. Topics include robotic system overview, rotational matrices,



translational matrices, homogeneous and composite matrices, D-H algorithm representation, Lagrange-Euler formulation, and robot planning. At the end of the course, shall design the robot mathematical modeling together complete with its simulation system. By the end of semester, students should be able to:

- CO1: Derive the robot kinematics using spatial movement.
- CO2: Develop robot dynamic using Lagrange-Euler formulation and robot trajectory planning
- CO3: Design a robotics system project in simulation
- CO4: Explain regarding about the project effectively

**BTI3413 Programming for Eng. Technologists**  
**Credit Hours: 3**  
**Prerequisites: None**

Synopsis

This course introduces the interfacing techniques between PC and external circuit built (Arduino/ NodeMCU) with the components such as temperature sensor, rain sensor, humidity sensor etc. using C/C++ programming language. Besides the intermediate level of programming techniques such as pointers, dynamic memory allocation, data structures, and graphical user interface (GUI) are also introduced to fit the purpose. By the end of the semester, the students apply the interfacing technique in a mechatronics-based project. Besides, to equip the students with IR4.0 stuff (IoT), the intermediate level of web programming is also introduced such as HTML, MySQL and PHP language as well as the HTTP protocol. In addition, the integration between web server and external circuit board (NodeMCU) with several basic sensors are initiated to make it relevant to mechatronics speciality.

By the end of semester, students should be able to:

- CO1: Apply concepts of pointers and data structures.

- CO2: Design a functional web-based page incorporation with several sensors
- CO3: Develop a graphical user interface using C/C++
- CO4: Construct an integration software with electrical devices/components.
- CO5: Orally present and collaborate effectively in a group on a project.

**BTI3603 Control Systems Engineering**  
**Credit Hours: 3**  
**Prerequisites: None**

Synopsis

This subject will cover the analysis of the stability and performance of the control system by using the time domain and frequency domain approaches. PID controllers will be used to improve the transient and steady state performances in the time domain approach. In the frequency domain approach, the bode plot method will be utilised. The lead, lag and lead-lag compensators are introduced in improving the performance of the control system using the frequency approach.

By the end of semester, students should be able to:

- CO1: Derive the mathematical model system in frequency domain and time domain
- CO2: Analyze the transient response, system stability and state response for first and second order systems.
- CO3: Design the PD, PI, PID, Lag, Lead and Lag-Lead compensators using root locus technique and frequency response technique.
- CO4: Discuss the systems performance between compensated and uncompensated based on transient and steady-state response

**BTI3523 Sensor and Instrumentation Systems**  
**Credit Hours: 3**  
**Prerequisites: None**

### Synopsis

This course covers sensor and instrumentation systems including the fundamental instrument principles, measurement techniques, data analysis, data processing, data conversion, and working principle of sensors, and measurement theory.

By the end of semester, students should be able to:

- CO1: Demonstrate proper treatment of instruments and their characteristics.
- CO2: Analyse transducer elements, intermediate elements and data acquisition systems (DAQ).
- CO3: Determine principles of the work and derive mathematical models of sensors for measuring physical characteristics (e.g. speed, pressure, temperature) by means of modern tools.
- CO4: Explain team-oriented projects for interfacing data acquisition systems with applications.

### **BTX3612 Industrial IoT**

**Credit Hours: 2**

**Prerequisites: None**

### Synopsis

Industrial Internet of Things (IIoT) is an application of IoT in industries to modify the various existing industrial systems. IIoT links the automation system with enterprise, planning and product lifecycle. Students will understand the advancement in the area of Industrial Internet of things (IIoT), which includes predictive and preventative maintenance, condition based monitoring of the machines, production optimization, energy optimization, supply-chain optimization and uptime of manufacturing utilities.

By the end of semester, students should be able to:

- CO1: Interpret the Industrial IOT as part of Industry 4.0
- CO2: Describe Industrial IOT model and communication architecture

CO3: Interpret Industrial IOT big data analytics and computing security

CO4: Analyse Industrial IOT case studies and related issues

### **BTI3403 Introduction to Machine Learning**

**Credit Hours: 3**

**Prerequisites: None**

### Synopsis

This course shall introduce the fundamentals of machine learning algorithms that includes both supervised and unsupervised models that are employed on a myriad of applications. Prior to the utilisation of the models, the students shall be equipped with the essential knowledge of handling data which include data preprocessing, basic data visualisation, feature extraction and selection. The students shall be exposed to different case studies ranging from clustering, regression/prediction/ forecasting and classification problems. By the end of the semester, the students will apply the knowledge gathered through this course via a project. An open-source machine learning and data visualisation toolkit, i.e. Orange Data Mining shall be utilised in this introductory course. By the end of semester, students should be able to:

- CO1: Apply the concepts of data visualisation, preparation as well as preprocessing
- CO2: Compare between different feature extraction and selection techniques
- CO3: Integrate different supervised and unsupervised machine learning models on a myriad of real world applications
- CO4: Demonstrate understanding of machine learning project effectively through a report prepared in a group

### **BTI3503 Electrical Drive System**

**Credit Hours: 3**

**Prerequisites: None**

### Synopsis

This course begins by introducing the basic

electrical drive system components. The modelling and equivalent system of the DC motor and induction motor will be derived. This will lead to the design of the drive system using flux controlled, voltage controlled, controlled rectifier, chopper controlled, scalar control.

By the end of semester, students should be able to:

- CO1: Demonstrate knowledge and principle of motor modelling and equivalent system
- CO2: Analyse DC motor equations and evaluate DC motor drive system for different operating conditions, regenerative braking conditions, quadrant operations
- CO3: Analyse induction motor equivalent system and its characteristic, speed control
- CO4: Investigate drive system characteristics through simulation and experiment

### **BTI3623 Capstone**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course requires the students to design and develop a controllable machine system with automation ability. The machine must be able to solve problems in industries and daily activities. It integrates the knowledge of mechanical and electronic design, software programming and manufacturing. Students are required to design and develop a machine in a group as well as performing individual engineering roles in a multidisciplinary setting. The design and development are for providing a solution with consideration of health and safety, economy, productivity, quality, environmental and sustainability.

By the end of semester, students should be able to:

- CO1: Construct product design requirement and produce relevant concept-to-final design specifications

CO2: Sketch concept design, drawings with GDT & BOM, circuit drawings and programming flowchart

CO3: Evaluate design parameters and properties through engineering design calculation, finite element analysis and circuit analysis

CO4: Develop detail manufacturing process planning including materials selection, tooling and process parameters

CO5: Build the product according to the proposed plan which includes the procurement, manufacturing, programming, assembly and testing

CO6: Demonstrate effective engineering communication by producing design book and conduct an oral presentation of the product

CO7: Initiate an active contribution as a member and leader of multidisciplinary team

CO8: Organise the project using project management tools with consideration of financial and man-hour aspect of product development

### **BTI3822 Internship Preparation**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course provides the students the skills to prepare their mentality and documentations to apply for a placement for their internship semester. The topics that will be covered are such as defining self-target and motivation in the engineering profession, task understanding and delegation, priority, and time management. The students should have the ability to plan and reflect on their own career development, read job advertisements and grasp the essential content in such a way that a targeted and successful application becomes possible, prepare a cover letter that is in a correct form and content for a specific job advertisement, to structure a curriculum vitae correctly, understand international aspects for studying engineering and to analyze it for your own situation, conduct a mock interview and prepare for it accordingly.

By the end of semester, students should be able to:

- CO1: Prepare proper plan and documentations for career development.
- CO2: Define the professional target for internship as well as after graduation.
- CO3: Complete excellent documentation to apply for an internship placement.

### **BTX3463 Artificial Intelligence**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course introduces students to the fundamentals of expert systems, fuzzy logic, artificial neural networks and genetic algorithm

By the end of semester, students should be able to:

- CO1: Interpret the principles of artificial intelligence correctly
- CO2: Apply AI methods, i.e., Fuzzy-Logic, ANN and Genetic Algorithm in different applications
- CO3: Demonstrate understanding effectively in a report the group work of an artificial intelligence mini-project

### **BTI4122 Professional Practice & Ethics**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course introduces the technologist profession in the local industries sector, issues in local industries, ethics and public responsibility.

By the end of semester, students should be able to:

- CO1: Evaluate the importance of technologist practices and its professionalism
- CO2: Relate to the technologies practices and ethical issues in engineering profession

### **BTI4113 Occupational Safety and Health**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course covers the topics on industrial safety and health regulations, accident causation phenomenon, accident investigation, accident analysis, industrial hazard, industrial hygiene and managing environment safety and health.

By the end of semester, students should be able to:

- CO1: Discuss the importance of occupational safety and health and OSHA regulations in workplace
- CO2: Analyse the practices in work places of employment contributing to serious possible damage
- CO3: Develop a solution to OSH problem in a given case study

### **BTI3122 Fundamental of IR4.0**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course is designed to offer students an introduction to Industry 4.0, its applications in the manufacturing world. Students will gain deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges.

By the end of semester, students should be able to:

- CO1: Classify the pillars of Industry 4.0 and the road to Industry 4.0
- CO2: Discuss the related disciplines, system, technologies for enabling Industry 4.0
- CO3: Discuss the role of data, information, knowledge and collaboration in future organizations
- CO4: Identify other applications, case studies and issues in Industry 4.0

**BTI4710 Final Year Project****Credit Hours: 10****Prerequisites: None**

## Synopsis

This course focuses on the research-oriented approach to engineering technology studies. Students are expected to develop techniques in literature review, perform individual analysis and judgement and show capability of being assessed independently. The application of project management elements as a medium for conducting and integrating all expertise areas during the course is highly encouraged. Students need to conduct applied based on the proposed research methodology. Students have to complete the course by submitting the thesis with formal presentation and a written report. Students will be assessed on the ability to work independently. By the end of semester, students should be able to:

- CO1: Demonstrate understanding of fundamental and technical knowledge.
- CO2: Assess problems on relevant topics and develop its solution.
- CO3: Design research methodology based on the given title.
- CO4: Integrate independent and lifelong learning skills in the broadest context of literature review.
- CO5: Organise research work through paper reports and presentations.
- CO6: Apply ethical principles and commit responsibility.
- CO7: Demonstrate project management according to engineering and technology practice.
- CO8: Construct a product using appropriate tools.

**BTI4812 Industrial Training****Credit Hours: 12****Prerequisites: None**

## Synopsis

In Industrial Training the students should gain insight into industrial practice, in order to visualize the tasks and possibilities of their

later occupation work. All students are required to undergo industrial training for a certain period that has been agreed by the faculty during the last semester of the academic year. The performance of each student during the periods of his/her industrial training is evaluated by the faculty staff, and the representatives from employer organizations.

By the end of semester, students should be able to:

- CO1: Evaluate skills and engineering technology fundamental knowledge in industry practice
- CO2: Initiate effort to apply acquired technical skill using modern technical tools for problem solving in the industry.
- CO3: Present the outcomes of industrial training in a formal oral presentation.
- CO4: Practice a professional and ethical working standard in an organization during the industrial training.
- CO5: Perform the ability to work as an individual and in a group with the capacity to be a leader or manager as well as an effective team member.

**BTX3523 Autonomous Robotic System****Credit Hours: 3****Prerequisites: None**

## Synopsis

This course introduces the students to the foundation of autonomous robotic systems. The course will start with the introduction of the common robotic system (mobile robot and robotic arm). The core of this course will address the problem of perception, localization, planning and control and robot motion and navigation. The course will be accompanied by a large practical part in which students have the opportunity to implement the fundamental theories that they learnt in lecture. After completing this course, students should be able to apply to understand the basic autonomous robotic system.

By the end of semester, students should be able to:

- CO1: Demonstrate understanding of the overall robotic system (close loop system, hardware software integration)
- CO2: Analyse the motion kinematic of non-holonomic system for lateral and longitudinal motion
- CO3: Assemble a middleware programming language for the autonomous system setup
- CO4: Develop an autonomous system architecture to solve engineering problems using middleware software stack.

### **BTI3413 Applied Machine Learning**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This intermediate-level course is the continuation of Introduction to Machine Learning (BTI3513). This course shall complement the prerequisite course by demonstrating the efficacy of machine learning algorithms that includes both supervised and unsupervised models. Prior to the utilisation of the models, the students shall be equipped with the essential knowledge of handling data which include data preprocessing, data visualisation, feature extraction and selection. The students shall be exposed to different case studies ranging from clustering, regression/prediction/forecasting and classification problems. By the end of the semester, the students will apply the knowledge gathered through this course via a project. An open-source machine learning and data visualisation toolkit, i.e. Spyder Python IDE shall be utilised in this intermediate-level course.

By the end of semester, students should be able to:

- CO1: Apply the concepts of data visualisation, preparation as well as preprocessing
- CO2: Employ different feature extraction and selection techniques
- CO3: Construct different supervised and unsupervised machine learning

models on a myriad of real world applications

- CO4: Demonstrate understanding of machine learning project effectively through a report prepared in a group

### **BTI3823 Automated Manufacturing Systems**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

Study of automated manufacturing systems utilized by industry, including robotics, computer-aided manufacturing, computer-aided design and manufacturing, computer-aided inspection, and system integration using PLC's, sensors, DAQ systems and other automation components. Emphasis on laboratory experiences with automated technology.

By the end of semester, students should be able to:

- CO1: Demonstrate various automation techniques currently used in industry.
- CO2: Classify and select sensors and their applications for inspection, measurement and control of manufacturing and assembly processes.
- CO3: Design and implement an automation project.

### **BTI3423 Machine Vision**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

To introduce students to the fundamentals of image formation mainly on cameras in static. To introduce students to the major ideas, methods, and techniques of computer vision and pattern recognition; to develop an appreciation for various issues in the design of computer vision and object recognition systems; and to provide the student with programming experience from implementing computer vision and object recognition applications.

By the end of semester, students should be able to:

- CO1: Demonstrates the concepts of machine vision understanding and preparation as well as image preprocessing
- CO2: Apply concepts of image features selection and representation techniques in manufacturing systems.
- CO3: Adapt various methods related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.
- CO4: Present in a group on a computer vision system for a specific problem

## CURRICULUM STRUCTURE BACHELOR OF MECHATRONIC ENGINEERING TECHNOLOGY (ROBOTICS) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH		
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	
BACHELOR OF MECHATRONIC ENGINEERING TECHNOLOGY (ROBOTICS) COURSES	BT11523 Electrical and Electronics	BTX1523 Analog Electronics	BT3513 Digital Electronics	BTX2143 Rapid Prototyping and Manufacturing	BT13403 Introduction to Machine Learning	BT13623 Capstone	BT14710 Final Year Project	BT14812 Industrial Training	
	BT11212 Statics	BT11133 Manufacturing Processes	BT12412 Computer Aided Engineering and Manufacturing	BT12123 Project Management Eng. Economy	BT13603 Control Systems Engineering	BT13523 Sensor and Instrumentation Systems	BT14122 Professional Practice & Ethics		
	BT11413 Computer Aided Design	BTX1222 Mechanics of Materials	BT12213 Dynamics	BT12622 Microcontroller	BT13503 Electrical Drive System	BT13822 Internship Preparation	BT14113 Occupational Safety and Health		
	BT11423 Programming		BTX2433 Computer Simulation	BTX2013 Software Development	BTX3612 Industrial IoT	BTX3463 Artificial Intelligence	BT13122 Fundamental of IR4.0		
	UQB**1 Co-Curriculum 1	BUM1223 Calculus	BTX2633 Machine Design	BTX2643 Robotic System Modelling	BT* 3**3 Elective 1	BT* 3**3 Elective 3			
	UHL2400 Fundamentals of English Language	UHF1111 Foreign Language 1	BUM2113 Applied Mathematics	BUM2423 Applied Statistics	BT* 3**3 Elective 2	BT* 3**3 Elective 4			
	BUM1113 Technical Mathematics	UHL2412 English For Academic Communications	UQ*2**1 Co-Curriculum 2	UHC1012 Falsafah dan Isu Semasa	UHL2432 English For Professional Communications	UGE2002 Technopreneurs hip			
	UHS1022 Soft-Skills	UHL2432 English For Technical Communications	UHF2041 Foreign Language 2						
	17	16	19	19	19	19	17		14
	140	OVERALL TOTAL CREDIT FOR GRADUATION							



**ELECTIVE COURSES FOR  
BACHELOR OF MECHATRONIC ENGINEERING TECHNOLOGY (ROBOTICS) WITH  
HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BTX3523	Autonomous Robotic System	3
2	BTI3413	Applied Machine Learning	3
3	BTI3823	Automated Manufacturing Systems	3
4	BTI3423	Machine Vision	3
<b>TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION</b>			<b>12</b>

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1	Graduates solve engineering technology problems
PEO2	Graduates are adaptable to a new working environment
PEO3	Graduates lead engineering task with teamwork and interpersonal skills.

PROGRAMME OUTCOMES (PO)

PO1	Apply the knowledge of technology fundamental to broadly-defined procedures, processes, systems and methodologies in the field of study.
PO2	Propose and employ current tools and techniques to resolve broadly-defined problems.
PO3	Demonstrate deep investigative and significant thinking abilities to solve broadly-defined problems in the field of study.
PO4	Communicate effectively and flexibly in oral and written language for social, academic and professional purposes.
PO5	Illustrate the understanding of corresponding issues related to the society and the subsequent responsibilities to the broadly-defined technology practices.
PO6	Acknowledge the requirement of professional establishment and to employ independent continuing learning in specialist technology.
PO7	Illustrate consciousness of management and technopreneurship routine in real perspective.
PO8	Illustrate ethical awareness and professionalism.
PO9	Illustrate leadership character, mentoring and work efficiently in diverse teams.

## **COURSE SYNOPSIS FOR DEGREE PROGRAMME 2022/2023**

### **BACHELOR OF MECHATRONIC ENGINEERING TECHNOLOGY (ROBOTICS) WITH HONOURS**

#### **BTI1523 Electrical and Electronics**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This module will introduce students to basic science of electricity, introduction to instrumentation and measurement, work and energy theorem, basic electrical circuits and introduction to magnetism.

By the end of semester, students should be able to:

CO1: Analyze the basic concept of electricity, semiconductor and transistor configuration in AC and DC conditions.

CO2: Apply basic electrical and electronic laws to solve circuit problems.

CO3: Demonstrate understanding effectively in written assignments related to electrical and electronic principles.

#### **BTI1212 Statics**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course introduces the force vector algebra, equilibrium of forces on particles, equilibrium of forces on single rigid bodies and simple force analysis on simple frames and machine structures (multi-rigid bodies) and problems involving dry friction.

By the end of semester, students should be able to:

CO1: Compute equilibrium of forces on particle problems

CO2: Analyze equilibrium of forces on single rigid body problems.

CO3: Identify equilibrium of forces on simple frame structure problems using computer aided force analysis programs.

#### **BTI1413 Computer Aided Design**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

The course presents the integration of Computer Aided Design and Drafting systems. By combining multiple methods for construction of the 2D drafting, creation of 3D solid / surface design model and 3D assembly, students should be able to prepare detailed documentation of engineering drawing and bill of material (BOM) according to industrial standards. Emphasizes will also be given on proper dimensioning techniques, identifying critical dimensions and tolerances for assembly parts and Geometric Dimensioning and Tolerancing (GD&T).

By the end of semester, students should be able to:

CO1: Comprehend standard procedures in sketching and technical drawing.

CO2: Develop standard drawing package consists of 2D assembly drawing, parts list and detailed part drawing.

CO3: Apply the knowledge of geometric modeling concepts used in commercial CAD/CAM software

CO4: Construct 3D parts, assembly models and drafting according to the engineering standards

#### **BTI1423 Programming**

**Credit Hours: 3 s**

**Prerequisites: None**

#### Synopsis

This course introduces the basics of the C programming language. The contents of this course includes coding input and output,

variables, constants, arithmetic operations, mathematical functions, user defined functions, loops, selection making decision and repetitive construct, array, and also data structure.

By the end of semester, students should be able to:

- CO1: Solve a mathematical problem using variables, constants, arithmetic operations, mathematical functions and user-defined functions with the correct rules.
- CO2: Organizes the flow of a program that uses decision making, repetition and loop statements without any errors.
- CO3: Assemble a program code that is related to mechatronics applications that follows a design specification.
- CO4: Manipulate the handling of arrays in a program to ensure correct calculated output is produced

### **BTX1523 Analog Electronics**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course introduces the basic semiconductor devices which are diodes, bipolar junction transistors (BJT), and operational amplifiers. It also presents BJT transistors operational characteristics that cover the DC and AC analysis. Lastly, students will learn how to analyze different types of operational amplifier circuits.

By the end of semester, students should be able to:

- CO1: Classify the characteristic and operation of semiconductor diodes and BJT transistor configuration in AC and DC condition.
- CO2: Demonstrate simulation of diode, transistor, and operational amplifier circuit using multisim software.
- CO3: Analyse various types of operational amplifiers and BJT configurations in AC and DC conditions.

### **BTI1133 Manufacturing Processes**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course introduces various challenges and issues in modern manufacturing process and operations, ranging from traditional topics such as casting, forming, machining and joining process.

By the end of semester, students should be able to:

- CO1: Identify the manufacturing process of metal casting, forming and shaping, joining and surface technology
- CO2: Classify the processing parameters of metal casting, forming, joining, and surface technology
- CO3: Propose a design of manufacturing process system that can be used in production that can contribute to public health and safety, cultural, societal, environmental and sustainability
- CO4: Recommend an optimized process parameters of a manufacturing process using research methods

### **BTX1222 Mechanics of Material**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course intends to provide basic mechanics of deformable bodies with emphasis on principles of stress and strain, shear and bending moment, torsion, buckling, failure criteria and design concepts.

By the end of semester, students should be able to:

- CO1: Perform stress analysis on a structure subject to axial loading and torsion
- CO2: Analyse a beam subject to pure bending and shear stress

CO3: Perform stress and strain transformation to find principal stresses and strain

### **BTI3513 Digital Electronics**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course is designed to introduce the basic principle of digital systems and digital circuit design with analysis. Lecture and tutorial will cover the following: Algebra Boolean, Numbering System, Basic Logic Gate, Combinational Logic Circuit Design, Bi-stable Memory Devices and Sequential Circuits Design.

By the end of semester, students should be able to:

- CO1: Apply numbering system, digital codes and digital component in digital electronics
- CO2: Analyze combinational logic circuits in digital system
- CO3: Analyze sequential logic circuits in digital system
- CO4: Demonstrate the simulation of a digital system using computer aided design tool

### **BTI2412 Computer Aided Engineering and Manufacturing**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course introduces students to develop a degree of competencies in the CAM principle, application, and integration that applied in the modern manufacturing system. Students will analyze structural stress and dynamics problems of a component or assembly using finite element method (FEM). Students also optimized 2-axis and 3-axis milling tool path strategies and parameters using computer-assisted simulation software with a sound knowledge of machining accuracy, cost and

efficiency. Finally, for a practical application, students execute NC code generation / editing, transferring of NC code to the CNC machine and run the program.

By the end of semester, students should be able to:

- CO1: Demonstrate the principal, application and integration of the CAM system in the manufacturing.
- CO2: Perform FEM of structural stress and dynamics problem using computer simulation software
- CO3: Write manual programming for CNC milling and CNC lathe
- CO4: Manipulate 2-axis and 3-axis milling tool path strategies with appropriate input of machining parameters and concern of machining accuracy, cost and efficiency using computer simulation software.
- CO5: Demonstrate actual machining for various mechanical parts on the CNC machine in a teamwork.

### **BTI2213 Dynamics**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course intends to apply the knowledge of basic principles of engineering dynamics including kinetics and kinematics motion of a point in both one and two dimensions, velocity in 1-D and 2-D and break down into components, methods of energy and momentum, Newton's laws of motion, vectors components and magnitudes as well as rigid body motion.

By the end of semester, students should be able to:

- CO1: Solve kinematic and kinetic problems for particles, systems of particles and rigid bodies.
- CO2: Explain momentum and energy methods problems for particles, systems of particles and rigid bodies.

CO3: Design as a team a case study/laboratory experiment related to principles of dynamics.

### **BTX2433 Computer Simulation**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course introduces simulation software MATLAB (simple operations, matrices and vectors, functions, plot, programming and symbolic calculation), graphical user interface build up and Simulink (functional principle of Simulink, designing a block diagram, solving differential equations).

By the end of semester, students should be able to:

- CO1: Solve mathematical equations/operations
- CO2: Construct functional programs in scripts
- CO3: Construct a graphical user interface
- CO4: Construct blocks diagrams using the Simulink
- CO5: Demonstrate simulation solution using Simulink and graphical user interface

### **BTX2433 Machine Design**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course focuses on the fundamentals of component design - free body diagrams, force flow concepts, failure theories, and fatigue design, with application to fasteners, springs, bearing, gears, shafts, clutches, and brakes. It explains the basics of mechanics, strength of materials, and material properties on how to apply these fundamentals to specific components design.

By the end of semester, students should be able to:

- CO1: Interpret the concept of machine design, design considerations for the

machine elements, load and member analysis, design of compression members

CO2: Analyze the failure of machine components due to static and variable loading, design of shafts

CO3: Design of power screws and mechanical springs

CO4: Calculate the center of gravity, centroid and moment of inertia for a body of arbitrary shape

### **BTX2143 Rapid Prototyping and Manufacturing**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

The participants will see the development of mobile robots as development of an overall mechatronic system. Students will do this by understanding the mechatronic processes, structural optimization, and material and solve manufacturing tasks by using Rapid Prototyping and Manufacturing technologies. In successful participation

- The students can describe the basic principles of mechatronic systems
- The students master the process chains of rapid prototyping and rapid manufacturing
- The students can apply what they have learnt in the development process of a system

By the end of semester, students should be able to:

- CO1: Interpret the basic principles of mechatronic systems and rapid prototyping
- CO2: Analyse design for rapid prototyping and manufacturing

### **BTI2123 Project Management and Engineering Economy**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course embraces a broad basic overview and principles of project management which has become central to operations in manufacturing enterprises throughout five stages of managing project; initialization, planning, execution, control and closing.

By the end of semester, students should be able to:

- CO1: Prepare a project charter which describes a preliminary framework of project's goal, scopes, high level deliverables and initial project evaluations.
- CO2: Develop a project planning using management tools, cost concepts and design economics.
- CO3: Demonstrate task scheduling using an ordered sequence of activities with time allotted.
- CO4: Perform actual performance at any of project duration.

### **BTI2622 Microcontroller**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course is an introduction to microcontroller systems and embedded devices. Students are exposed to microcontroller architecture, peripherals, and subsystems. These include processing unit, registers, memory, internal data flow, I/O, timer, PWM, Analog Digital Converter, interrupt, serial communication, Master-Slave configuration.

By the end of semester, students should be able to:

- CO1: Demonstrate microcontroller's principle of the work and its architecture.
- CO2: Assemble microcontroller program with its peripherals and subsystem in simulation and hardware.
- CO3: Develop a solution for engineering problems using microcontrollers.
- CO4: Discuss effectively in group works, presentations, and reports.

### **BTI2013 Software Development**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course covers C#, object-oriented analysis and design, Unified Modeling Language and multi-layers software design. By the end of semester, students will design and develop software for a specific system.

By the end of semester, students should be able to:

- CO1: Convert other program to C# program
- CO2: Apply concepts of object-oriented to solve programming problems
- CO3: Design software using the UML and multilayer
- CO4: Construct an integration software with electrical devices/components
- CO5: Orally present and collaborate effectively in a group on a mechatronics-based project

### **BTX2643 Robotic System Modelling**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course provides an overview of robot mechanism, kinematics, motion kinematic, dynamics and planning control. Topics include robotic system overview, rotational matrices, translational matrices, homogeneous and composite matrices, D-H algorithm representation, Lagrange-Euler formulation, and robot planning. At the end of the course, shall design the robot mathematical modelling together complete with its simulation system.

By the end of semester, students should be able to:

- CO1: Derive the robot kinematics using spatial movement.
- CO2: Develop robot dynamic using Lagrange-Euler formulation and robot trajectory planning

- CO3: Design a robotics system project in simulation
- CO4: Explain regarding about the project effectively

### **BTI3403 Introduction to Machine Learning**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course shall introduce the fundamentals of machine learning algorithms that includes both supervised and unsupervised models that are employed on a myriad of applications. Prior to the utilisation of the models, the students shall be equipped with the essential knowledge of handling data which include data preprocessing, basic data visualisation, feature extraction and selection. The students shall be exposed to different case studies ranging from clustering, regression/ prediction/ forecasting and classification problems. By the end of the semester, the students will apply the knowledge gathered through this course via a project. An open-source machine learning and data visualisation toolkit, i.e. Orange Data Mining shall be utilised in this introductory course. By the end of semester, students should be able to:

- CO1: Apply the concepts of data visualisation, preparation as well as preprocessing
- CO2: Compare between different feature extraction and selection techniques
- CO3: Integrate different supervised and unsupervised machine learning models on a myriad of real world applications
- CO4: Demonstrate understanding of machine learning project effectively through a report prepared in a group

### **BTI3603 Control Systems Engineering**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This subject will cover the analysis of the

stability and performance of the control system by using the time domain and frequency domain approaches. PID controllers will be used to improve the transient and steady state performances in the time domain approach. In the frequency domain approach, the bode plot method will be utilised. The lead, lag and lead-lag compensators are introduced in improving the performance of the control system using the frequency approach.

By the end of semester, students should be able to:

- CO1: Derive the mathematical model system in frequency domain and time domain
- CO2: Analyze the transient response, system stability and state response for first and second order systems.
- CO3: Design the PD, PI, PID, Lag, Lead and Lag-Lead compensators using root locus technique and frequency response technique.
- CO4: Discuss the systems performance between compensated and uncompensated based on transient and steady-state response

### **BTI3503 Electrical Drive System**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course begins by introducing the basic electrical drive system components. The modelling and equivalent system of the DC motor and induction motor will be derived. This will lead to the design of the drive system using flux controlled, voltage controlled, controlled rectifier, chopper controlled, scalar control.

By the end of semester, students should be able to:

- CO1: Demonstrate knowledge and principle of motor modelling and equivalent system
- CO2: Analyse DC motor equations and evaluate DC motor drive system for

different operating conditions, regenerative braking conditions, quadrant operations

CO3: Analyse induction motor equivalent system and its characteristic, speed control

CO4: Investigate drive system characteristics through simulation and experiment

### **BTX3612 Industrial IoT**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

Industrial Internet of Things (IIoT) is an application of IoT in industries to modify the various existing industrial systems. IIoT links the automation system with enterprise, planning and product lifecycle. Students will understand the advancement in the area of Industrial Internet of things (IIoT), which includes predictive and preventative maintenance, condition based monitoring of the machines, production optimization, energy optimization, supply-chain optimization and uptime of manufacturing utilities.

By the end of semester, students should be able to:

CO1: Interpret the Industrial IOT as part of Industry 4.0

CO2: Describe Industrial IOT model and communication architecture

CO3: Interpret Industrial IOT big data analytics and computing security

CO4: Analyse Industrial IOT case studies and related issues

### **BTI3623 Capstone**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course requires the students to design and develop a controllable machine system

with automation ability. The machine must be able to solve problems in industries and daily activities. It integrates the knowledge of mechanical and electronic design, software programming and manufacturing. Students are required to design and develop a machine in a group as well as performing individual engineering roles in a multidisciplinary setting. The design and development are for providing a solution with consideration of health and safety, economy, productivity, quality, environmental and sustainability.

By the end of semester, students should be able to:

CO1: Construct product design requirement and produce relevant concept-to-final design specifications

CO2: Sketch concept design, drawings with GDT & BOM, circuit drawings and programming flowchart

CO3: Evaluate design parameters and properties through engineering design calculation, finite element analysis and circuit analysis

CO4: Develop detail manufacturing process planning including materials selection, tooling and process parameters

CO5: Build the product according to the proposed plan which includes the procurement, manufacturing, programming, assembly and testing

CO6: Demonstrate effective engineering communication by producing design book and conduct an oral presentation of the product

CO7: Initiate an active contribution as a member and leader of multidisciplinary team

CO8: Organise the project using project management tools with consideration of financial and man-hour aspect of product development

### **BTI3523 Sensor and Instrumentation Systems**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis



This course covers sensor and instrumentation systems including the fundamental instrument principles, measurement techniques, data analysis, data processing, data conversion, and working principle of sensors, and measurement theory.

By the end of semester, students should be able to:

- CO1: Demonstrate proper treatment of instruments and their characteristics.
- CO2: Analyse transducer elements, intermediate elements and data acquisition systems (DAQ).
- CO3: Determine principles of the work and derive mathematical models of sensors for measuring physical characteristics (e.g. speed, pressure, temperature) by means of modern tools.
- CO4: Explain team-oriented projects for interfacing data acquisition systems with applications.

### **BTI3822 Internship Preparation**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course provides the students the skills to prepare their mentality and documentations to apply for a placement for their internship semester. The topics that will be covered are such as defining self-target and motivation in the engineering profession, task understanding and delegation, priority, and time management. The students should have the ability to plan and reflect on their own career development, read job advertisements and grasp the essential content in such a way that a targeted and successful application becomes possible, prepare a cover letter that is in a correct form and content for a specific job advertisement, to structure a curriculum vitae correctly, understand international aspects for studying engineering and to analyze it for your own situation, conduct a mock interview and prepare for it accordingly.

By the end of semester, students should be able to:

- CO1: Prepare proper plan and documentations for career development.
- CO2: Define the professional target for internship as well as after graduation.
- CO3: Complete excellent documentation to apply for an internship placement.

### **BTX3463 Artificial Intelligence**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course introduces students to the fundamentals of expert systems, fuzzy logic, artificial neural networks and genetic algorithm

By the end of semester, students should be able to:

- CO1: Interpret the principles of artificial intelligence correctly
- CO2: Apply AI methods, i.e., Fuzzy-Logic, ANN and Genetic Algorithm in different applications
- CO3: Demonstrate understanding effectively in a report the group work of an artificial intelligence mini-project

### **BTI4122 Professional Practice & Ethics**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course introduces the technologist profession in local industries sector, issues in local industries, ethics and public responsibility.

By the end of semester, students should be able to:

- CO1: Evaluate the importance of technologist practices and its professionalism

CO2: Relate to the technologies practices and ethical issues in engineering profession

### **BTI4113 Occupational Safety and Health**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

This course covers the topics on industrial safety and health regulations, accident causation phenomenon, accident investigation, accident analysis, industrial hazard, industrial hygiene and managing environment safety and health.

By the end of semester, students should be able to:

- CO1: Discuss the importance of occupational safety and health and OSHA regulations in the workplace.
- CO2: Analyse the practices in work places of employment contributing to serious possible damage.
- CO3: Develop a solution to the OSH problem in a given case study.

### **BTI3122 Fundamental of IR4.0**

**Credit Hours: 2**

**Prerequisites: None**

#### Synopsis

This course is designed to offer students an introduction to Industry 4.0, its applications in the manufacturing world. Students will gain deep insights into how smartness is being harnessed from data and appreciate what needs to be done in order to overcome some of the challenges.

By the end of semester, students should be able to:

- CO1: Classify the pillars of Industry 4.0 and the road to Industry 4.0
- CO2: Discuss the related disciplines, system, technologies for enabling Industry 4.0

CO3: Discuss the role of data, information, knowledge and collaboration in future organizations

CO4: Identify other applications, case studies and issues in Industry 4.0

### **BTI4710 Final Year Project**

**Credit Hours: 10**

**Prerequisites: None**

#### Synopsis

This course focuses on the research-oriented approach to engineering technology studies. Students are expected to develop techniques in literature review, perform individual analysis and judgement and show capability of being assessed independently. The application of project management elements as a medium for conducting and integrating all expertise areas during the course is highly encouraged. Students need to conduct applications based on the proposed research methodology. Students have to complete the course by submitting the thesis with formal presentation and a written report. Students will be assessed on the ability to work independently.

By the end of semester, students should be able to:

- CO1: Demonstrate understanding of fundamental and technical knowledge.
- CO2: Assess problems on relevant topics and develop its solution.
- CO3: Design research methodology based on the given title.
- CO4: Integrate independent and lifelong learning skills in the broadest context of literature review.
- CO5: Organise research work through paper reports and presentations.
- CO6: Apply ethical principles and commit responsibility.
- CO7: Demonstrate project management according to engineering and technology practice.
- CO8: Construct a product using appropriate tools.

**BTI4812 Industrial Training****Credit Hours: 12****Prerequisites: None**

## Synopsis

In Industrial Training the students should gain insight into industrial practice, in order to visualize the tasks and possibilities of their later occupation work. All students are required to undergo industrial training for a certain period that has been agreed by the faculty during the last semester of the academic year. The performance of each student during the periods of his/her industrial training is evaluated by the faculty staff, and the representatives from employer organizations.

By the end of semester, students should be able to:

- CO1: Evaluate skills and engineering technology fundamental knowledge in industry practice
- CO2: Initiate effort to apply acquired technical skill using modern technical tools for problem solving in the industry.
- CO3: Present the outcomes of industrial training in a formal oral presentation.
- CO4: Practice a professional and ethical working standard in an organization during the industrial training.
- CO5: Perform the ability to work as an individual and in a group with the capacity to be a leader or manager as well as an effective team member.

**BTX3523 Autonomous Robotic System****Credit Hours: 3****Prerequisites: None**

## Synopsis

This course introduces the students to the foundation of autonomous robotic systems. The course will start with the introduction of the common robotic system (mobile robot and robotic arm). The core of this course will address the problem of perception, localization, planning and control and robot

motion and navigation. The course will be accompanied by a large practical part in which students have the opportunity to implement the fundamental theories that they learnt in lecture. After completing this course, students should be able to apply to understand the basic autonomous robotic system.

By the end of semester, students should be able to:

- CO1: Demonstrate understanding of the overall robotic system (close loop system, hardware software integration)
- CO2: Analyse the motion kinematic of non-holonomic system for lateral and longitudinal motion
- CO3: Assemble a middleware programming language for the autonomous system setup
- CO4: Develop an autonomous system architecture to solve engineering problems using middleware software stack.

**BTI3413 Applied Machine Learning****Credit Hours: 3****Prerequisites: None**

## Synopsis

This intermediate-level course is the continuation of Introduction to Machine Learning (BTI3513). This course shall complement the prerequisite course by demonstrating the efficacy of machine learning algorithms that includes both supervised and unsupervised models. Prior to the utilisation of the models, the students shall be equipped with the essential knowledge of handling data which include data preprocessing, data visualisation, feature extraction and selection. The students shall be exposed to different case studies ranging from clustering, regression/prediction/forecasting and classification problems. By the end of the semester, the students will apply the knowledge gathered through this course via a project. An open-source machine learning and data visualisation toolkit, i.e. *Spyder Python* IDE shall be utilised in this intermediate-level course.

By the end of semester, students should be

able to:

- CO1: Apply the concepts of data visualisation, preparation as well as preprocessing
- CO2: Employ different feature extraction and selection techniques
- CO3: Construct different supervised and unsupervised machine learning models on a myriad of real world applications
- CO4: Demonstrate understanding of machine learning project effectively through a report prepared in a group

### **BTI3823 Automated Manufacturing Systems**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

Study of automated manufacturing systems utilized by industry, including robotics, computer-aided manufacturing, computer-aided design and manufacturing, computer-aided inspection, and system integration using PLC's, sensors, DAQ systems and other automation components. Emphasis on laboratory experiences with automated technology.

By the end of semester, students should be able to:

- CO1: Demonstrate various automation techniques currently used in industry.
- CO2: Classify and select sensors and their applications for inspection, measurement and control of manufacturing and assembly processes.
- CO3: Design and implement an automation project.

### **BTI3423 Machine Vision**

**Credit Hours: 3**

**Prerequisites: None**

#### Synopsis

To introduce students to the fundamentals of image formation mainly on cameras in static. To introduce students to the major ideas, methods, and techniques of computer vision and pattern recognition; to develop an appreciation for various issues in the design of computer vision and object recognition systems; and to provide the student with programming experience from implementing computer vision and object recognition applications.

By the end of semester, students should be able to:

- CO1: Demonstrates the concepts of machine vision understanding and preparation as well as image preprocessing.
- CO2: Apply concepts of image features selection and representation techniques in manufacturing systems.
- CO3: Adapt various methods related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.
- CO4: Present in a group on a computer vision system for a specific problem.

## CURRICULUM STRUCTURE BACHELOR OF MECHATRONIC ENGINEERING WITH HONOURS

YEAR SEMESTER	FIRST & SECOND	SHORT SEM 1	SECOND		SHORT SEM 2	THIRD		FOURTH		FIFTH FIRST
			FIRST & SECOND	FIRST & SECOND		FIRST & SECOND	FIRST & SECOND	SECOND		
MECHATRONICS ENGINEERING CORE COURSES (DUAL DEGREE)	BHM1103 Statics	UHD2333 German B1.1	BHM223 Electronics Engineering 2	BHM2342 Mechanical and Electrical Components	UHD2363 German B2.2	BHM2313 Microcomputer Technology	BHM3912 Internship	BHM4904 Team Oriented Project Study	BHM4003 Information Systems	
	BHM1113 Engineering Materials		BHM2103 Dynamics	BHM3703 Industrial 4.0		BHM3362 Industrial Concept Design		BHM4942 Preparation for Bachelor Thesis		
	BHM1612 CAD Modelling		BHM2342 Mechanical and Electrical Components	BHM3722 SMD Technology		BHM3513 Manufacturing Quality Management		BHM4914 Bachelor Thesis		
	BHM1821 Engineering Workshop		BHM2013 Programming for Engineers	BHM3342 Product Development		BHM3602 Quality Inspection		BHM4931 Final Examination		
	BHM1313 Electronics Engineering 1		BHM2333 Electronics Engineering 3	BHM3352 Electrical Actuator and Small Drives		BHM3352 Electrical Actuator and Small Drives				
	BHM2003 Computer Programming		BHM2212 Thermal-Fluid Engineering	BHM3012 Numerical Programming		BHM3012 Numerical Programming				
			BHM3013 Software Engineering	BHM3922 Internship Preparation		BHM3922 Internship Preparation				
			BHM2403 Manufacturing Processes	BHM4103 Control Systems Engineering		BHM4103 Control Systems Engineering				
			UHD2313 German A1	BHM4102 Finite Element Analysis		BHM4102 Finite Element Analysis				
				BHM3321 Design Exercise		BHM3321 Design Exercise				
	UHD2323 German A2	UHD2343 German B1.2	BHM3332 Sensor and Instrumentation Systems							
			BHMXXX3 Focus Module 1(a)							
			BHMXXX3 Focus Module 1(b)							
			BHM4921 Engineers & Society							
			BHM3942 Engineers & Society							
			BHM4911 Engineering Communication							
			Environment Safety & Health							
125	20	6	24	6	35	13	17	10		
21 (12)	University Required Courses : Applied Calculus, Applied Statistics, Ordinary Differential Equations, Penghayatan Etika dan Peradaban, Falsafah dan Isu Semasa, Soft Skills, Co-Curriculum I, Co-Curriculum II, Technopreneurship, German A1, German A2, German B1.1, German B1.2, German 2.1, German B2.2									
146	Total Credit for Graduation 146									

**ELECTIVE COURSES FOR  
BACHELOR OF MECHATRONIC ENGINEERING WITH HONOURS BHM**

NO.	Focus Module (electives):	COURSE	
1	Microtechnology	Focus 1a: BHM3823 Hybrid Integration	Focus 2a: BHM3833 Microtechnology Lab
2		Focus 1b: BHM3813 Clean Room Technology	Focus 2b: BHM3843 Energy Harvesting for Autonomous Microsystems
3	Robotics	Focus 1a: BHM3913 Math. Basics of Robotics and Image Processing	Focus 2a: BHM3933 Control System Eng. 2
4		Focus 1b: BHM3923 Rapid Prototyping and Manufacturing	Focus 2b: BHM3943 Robotics + Lab.
TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION			12

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	To produce engineering technologists with mastery of the needed expertise in manufacturing industries using the foundation of technology and innovation.
PEO2	To prepare engineering technologists that demonstrate skills of lifelong learning for professional and personal development.
PEO3	To prepare engineering technologists with good management skills, good professional ethics and understanding local law in manufacturing issues.
PEO4	To prepare global engineering technologists that work and communicate effectively in multinational and multidisciplinary engineering community.

**PROGRAMME OUTCOMES (PO)**

PO1	Apply knowledge of mathematics, science, engineering fundamentals and engineering specialisation principles to define and manufacturing engineering technology procedures, processes, systems or methodologies
PO2	Solve broadly-defined engineering technology problems systematically to reach substantiated conclusions by using tools and techniques appropriate to manufacturing engineering technology field.
PO3	Design solutions for broadly-defined manufacturing engineering technology problems, and to design systems, components or processes to meet specified needs with appropriate consideration for public health and safety, as well as cultural, societal, environmental and sustainability concerns.
PO4	Plan and conduct experimental investigations of broadly-defined problems using data from relevant sources
PO5	Select and apply appropriate techniques, resources and modern engineering technology tools, with an understanding of their limitations
PO6	Function effectively as individuals, and as members or leaders in diverse technical teams.
PO7	Communicate effectively with the engineering community and society at large.

PO8	Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.
PO9	Demonstrate an understanding of professional ethics, responsibilities and norms of engineering technology practices.
PO10	Demonstrate an awareness of management, business practices and entrepreneurship
PO11	Demonstrate an understanding of the impact of engineering practices, taking into account the need for sustainable development.
PO12	Recognize the need for professional development and to engage in independent and lifelong learning

## COURSE SYNOPSIS FOR DEGREE PROGRAMME 2022/2023

### COURSE SYNOPSIS FOR BACHELOR OF MECHATRONIC ENGINEERING WITH HONOURS BHM

#### BHM1103 Statics

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces the concepts of force vector algebra and free-body diagrams to solve problems on equilibrium of forces. The course covers six major chapters in engineering mechanics of statics as follows: 1. Equilibrium of forces on a particle, 2. Equilibrium of forces on a single rigid body, 3. Equilibrium of forces on simple trusses, frames and machine structures (multi-rigid bodies), 4. Equilibrium of forces in dry friction, 5. Centre of gravity and centroid and 6. Moments of inertia

- CO1: Solve problems on equilibrium of forces for particles and rigid bodies using the equation of equilibrium.
- CO2: Analyze problems on equilibrium of forces for trusses, frames and machines
- CO3: Analyze problems on equilibrium of rigid bodies subjected to dry frictional forces
- CO4: Determines the centre of gravity, centroid and moment of inertia for a body of arbitrary shape
- CO5: Design solutions for complex engineering problems for a simple structure in equilibrium.

#### BHM1113 Engineering Materials

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces the fundamental concepts of engineering materials which includes the structure of materials, mechanical and physical properties of materials, binary phase diagrams, isothermal diagram, heat treatment, applications and

current developments of metal, polymer, ceramic, composite and advanced materials. Also, basic understanding on the environmental degradation of engineering materials.

- CO1: Identify the atomic bonding and the crystal structures as well as the mechanical and physical properties of engineering materials
- CO2: Analyse various types of engineering materials based on their microstructures, properties and failure behaviours.
- CO3: Illustrate structure-property correlations of materials based on phase diagram, heat treatment and strengthening mechanism.
- CO4: Recommend a suitable material for engineering applications based on product design requirements.
- CO5: Identify the importance of environmental considerations and sustainability in engineering materials.
- CO6: Communicate effectively regarding materials-related projects in oral presentation.

#### BHM1612 CAD Modelling

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

After successful completion of this course, students can create hand-drawn sketches, read technical drawings, create standards drawing, and create parts lists. Further course content includes using 3D CAD systems to model components, assemblies, technical drawings, and prepare model data for CAD data exchange.

- CO1: Apply knowledge of geometric modeling concepts using hand-drawn sketches
- CO2: Design 2D technical drawings according to engineering standard and generate part lists
- CO3: Generate 3D solid parts and assembly models with its engineering drawing according to engineering standard

#### BHM1821 Engineering Workshop

**Credit Hours: 1**



**Prerequisite: None****Synopsis**

This course introduces the students to the fundamental knowledge and principle of metal removing process. In this course, students will apply theoretical knowledge to perform the actual material removal operation using appropriate tools and techniques according to required dimensions, tolerance, and specification and safety regulations.

- CO1: Apply the role of safety and regulatory compliance in the metalworking machine shop floor (workbench, hand tools, lathe and milling machines).
- CO2: Apply knowledge of technical drawing interpretation, process planning and perform basic material removal processes using hand tools, lathe and milling machines with correct sequence of machining operation.
- CO3: Conduct the machining operation using appropriate tools and techniques.

**BHM1123 Mechanics of Materials****Credit Hours: 3****Prerequisite: BHM1103, BHM1113****Synopsis**

This course covers the concept of stress and strain, stress and strain under axial, torsion, bending, and transverse-shear and combined loadings in elastic structural members. This course also covers the plane stress transformation.

- CO1: Apply the concept of stress and strain in mechanics of materials.
- CO2: Apply the stress and strain calculations in structural members subjected to axial loads and torsional loads.
- CO3: Apply the stress and strain calculations in structural members subjected to the bending and shear loads.
- CO4: Analyze the stress and strain in structural members subjected to the combined load and analyze the stress transformation to solve problems in mechanics of materials.

- CO5: Design solution of complex engineering problems related to mechanics of materials.

**BHM1313 Electronics Engineering 1****Credit Hours: 3****Prerequisite: None****Synopsis**

This course introduces circuit theory analysis which includes ohm laws, KCL, KVL, thevenin, mesh, superposition and transient analysis of RC and RL network. The digital logic circuits cover analogue versus digital, number system, logic gates, SOP & POS and K-maps.

- CO1: Apply fundamental laws, circuit theorems and method of analysis to solve electrical circuit
- CO2: Analyze transient response and steady state response of circuit applications
- CO3: Solve number systems and logic gates problem in digital system
- CO4: Analyze electrical and digital circuit using simulation software

**BHM2103****Dynamics****Credit Hours: 3****Prerequisite: BHM1103****Synopsis**

This course introduces two major sections involving a motion of a rigid body; 1. Planar kinematics, and, 2. Planar kinetics. In planar kinematics, principles of rigid body motion in terms of translation and rotation will be discussed. For planar kinetics, principles of rigid body motion utilizing force and acceleration method, work and energy method and impulse and momentum method will be studied.

- CO1: Analyze problems on planar kinematics of a rigid body for relative-motion analysis involving velocity and acceleration.
- CO2: Analyze problems involving kinetics of a planar kinetics of a rigid body using force and acceleration method.
- CO3: Solve problems involving kinetics of a planar kinetics of a rigid body using work and energy method.

- CO4: Solve problems involving kinetics of a planar kinetics of a rigid body using impulse and momentum method.
- CO5: Design solutions for complex engineering problems for a simple planar mechanism using kinematics principles.

### **BHM2003 Computer Programming**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces the basics of the C programming language. The contents of this course includes coding input and output, variables, constants, arithmetic operations, mathematical functions, user defined functions, loops, selection making decision and repetitive construct, array, and also data structure. The programming language used for the course is C/C++ language.

- CO1: Solve a mathematical problem using variables, constants, arithmetic operations, mathematical functions and user-defined functions with the correct rules.
- CO2: Organizes the flow of a program that uses decision making, repetition and loop statements without any errors.
- CO3: Develop a program code that is related to mechatronics applications that follows a design specification.
- CO4: Analyze the handling of arrays in a program to ensure correct calculated output is produced.
- CO5: Write an organized and readable C program code without producing compile and output result errors.

### **BHM2342 Mechanical and Electrical Components**

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

This course aims to introduce mechanical/electrical components in a mechatronic system, basic knowledge on costing and basic project management technique. The content of this course is divided into three parts namely, mechanical component (Part A),

electrical components (Part B) and basic of costing (Part C). Part A covers mechanical measurement (fits and tolerance), components guides, springs, power transmission components and fasteners. Part B comprises the basics of printed circuit board and electrical-drive-system. Whereas, Part C covers the basics of costing including cost structure, manufacturing cost and break-even analysis. By learning this course the students will be able to select components based on analysed design requirements and finally assemble them into a functional mechatronic system.

- CO1: Select mechanical components and their specification based on design requirements in a mechatronics systems
- CO2: Select electrical components and their specification based on design requirements in a mechatronics systems
- CO3: Examine a mechatronic system to perform basic costing analysis and recommend possible solution to justify cost and efficiency
- CO4: Manage a mini projects that involve component selection, procurement and assembly of a mechatronic system using appropriate project management tools

### **BHM2403 Manufacturing Processes**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces various challenges and issues in modern manufacturing process and operations, ranging from traditional topics such as casting, forming, machining and joining process.

- CO1: Identify the manufacturing process of metal casting, forming and shaping, joining and surface technology.
- CO2: Analyse the mechanics and processing parameters of metal casting, forming, joining, and surface technology.
- CO3: Propose a design manufacturing process system that can be used in the production that can contribute to public, health and safety, cultural

society, environmental and sustainability.

CO4: Recommend optimized process parameters of a manufacturing process using research methods.

### **BHM2212 Thermal-Fluid Engineering**

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

This course introduces the fluid dynamic concepts and analytical approaches to approximate the solutions of thermofluids problems at conceptual design stage. An introduction to mechanical engineering thermodynamics, dealing with the application of the first and second laws of thermodynamics to the thermodynamic performance analysis of typical thermo-mechanical plant components, using condensable vapours or gasses as the working fluid. The course includes energy and entropy balance for closed and open systems. Basic fluid mechanics including: kinematics and dynamics of fluid flows; conservation laws applied to fluid flow; Euler, Bernoulli, Navier-Stokes equations; dimensional analysis; differential and integral flow analysis; flow visualisation.

CO1: Explain three thermodynamic laws and fundamental principles in thermodynamics and fluid mechanics.

CO2: Solve problems related to thermal and fluid systems by applying thermodynamic laws and fluid principles.

CO3: Identify different power systems and fluid problems in thermal fluid systems.

CO4: Evaluate conceptual design solutions for complex engineering problems using properties of an idealised thermal fluid model individually and in group

### **BHM3303 Sensor and Instrumentation Systems**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course covers sensor and instrumentation systems including the fundamental instrument principles, measurement techniques, data analysis, data processing, data conversion, and working principle of sensors, and measurement theory.

CO1: Determine general treatment of instruments and sensors with their characteristics.

CO2: Analyse transducer elements, intermediate elements and data acquisition systems (DAQ)

CO3: Determine principles of the work and derive mathematical models of sensors for measuring physical characteristics (e.g. speed, pressure, temperature) by means of modern tools.

CO4: Develop team-oriented project for interfacing data acquisition system with sensor and instrument application.

### **BHM4103 Control System Engineering**

**Credit Hours: 3**

**Prerequisite: BHM3513**

#### Synopsis

This subject will cover the analysis of the stability and performance of the control system by using the time domain and frequency domain approaches. PID controllers will be used to improve the transient and steady state performances in the time domain approach. In the frequency domain approach, the bode plot method will be utilized. The lead, lag and lead-lag compensators are introduced in improving the performance of the control system using the frequency approach.

CO1: Derive the mathematical model system in frequency domain and time domain.

CO2: Analyze the transient response, system stability and state response for first and second order systems.

CO3: Design the PD, PI, PID, Lag, Lead and Lag-Lead compensators using root

locus technique and frequency response technique.

- CO4: Discuss the systems performance between compensated and uncompensated based on transient and steady-state response.

### **BHM4911 Environment Safety and Health**

**Credit Hours: 1**

**Prerequisite: None**

#### Synopsis

This course covers the topics on industrial safety and health regulations, accident causation phenomenon, accident investigation, accident analysis, industrial hazard, industrial hygiene and managing environmental safety and health.

- CO1: Explain the importance of environmental safety and health and OSHA regulations in workplace
- CO2: Analyse the practices in work places of employment contributing to serious possible damage to life, health and property.
- CO3: Develop a solution to the ESH problem in a given case study.

### **BHM2323 Electronics Engineering 2**

**Credit Hours: 3**

**Prerequisite: BHM1313**

#### Synopsis

In this course students will learn about discrete electronic circuits; that is, circuits containing discrete resistors, capacitors, diodes and transistors. The analysis of these fundamental circuits provides a key understanding of circuit operation and characteristics. Throughout this course, students will also develop, analyze, and design more complex analog electronic circuits by combining and expanding the basic circuits considered, to form more complex circuits. Lastly, students will learn how to analyze and design discrete circuits, these circuits are usually fabricated as integrated circuits called operational amplifiers.

- CO1: Explain the Principle Operation of Active Device Characteristics (e.g Diode, Bipolar Junction Transistor

(BJT), Field Effect Transistor (FET), and Metal Oxide Semiconductor Field Effect Transistor (MOSFET)

- CO2: Explain and Analyse Various Type of Transistor Circuits (e.g., biasing circuits and small signal model circuits)
- CO3: Explain and Analyse Different Type Operational-Amplifier Circuits
- CO4: Design and Analyze Operational Amplifier Applications

### **BHM2333 Electronics Engineering 3**

**Credit Hours: 3**

**Prerequisite: BHM1313, BHM2323**

#### Synopsis

This course is designed to introduce the basic principle of digital systems and logic implementation with analysis. Lecture and practical will cover the following: Logic Implementation, data path unit elements, bi-stable memory devices and finite state machines.

- CO1: Applying logic implementation in a digital system.
- CO2: Analyzing processing unit, storage and bussing circuits of a digital system.
- CO3: Analyzing the control unit of a digital system.
- CO4: Construct digital schematics using computer aided design tools.

### **BHM2013 Programming for Engineers**

**Credit Hours: 3**

**Prerequisite: BHM2003**

#### Synopsis

This course introduces the parallel/serial interfacing techniques between PC and external circuit built with the components such as LEDs, motors (DC/stepper), thermometer etc. using C/C++ programming language. In addition, the intermediate level of programming techniques such as pointers, dynamic memory allocation, data structures, and graphical user interface are also introduced to fit the purpose. By the end of semester, the students apply the interfacing techniques in a mechatronics-based project.

- CO1: Apply concepts of pointers, data structures and logical bitwise.
- CO2: Develop a graphical user interface.
- CO3: Construct an integration software with electrical devices/components and mechanical systems.
- CO4: Orally present and collaborate effectively in a group on a mechatronics-based project.

### **BHM3012 Numerical Programming**

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

This course introduces simulation software MATLAB (Simple operations, matrices and vectors, functions, plot, programming and symbolic calculation) and Simulink (functional principle of Simulink, designing a block diagram, solving differential equation, starting simulink systems from MATLAB and importing plots to word and power points).

- CO1: Solve mathematical equations / operations in MATLAB
- CO2: Construct functional programs in Scripts/m.file
- CO3: Design blocks diagrams using the Simulink toolboxes
- CO4: Develop simulation solution/project for dynamic Mechatronics systems in Simulink / MATLAB

### **BHM4942 Preparation of Bachelor Thesis**

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

This course introduces students to organize their bachelor thesis in terms of contents and time. It is based on the procedure and tool of scientific works. The task of the bachelor thesis becomes appropriate to the designed and related information of editing the Bachelor thesis are developed and structured.

- CO1: Planning of the contents and structure of bachelor thesis.
- CO2: Organize and complete the bachelor thesis in a structured manner within allocated time.

### **BHM3722 SMD Technology**

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

This lecture gives an introduction into PCB technology and the connections and interconnections of the board. The development and the production of single- and multi-layer PCBs are presented in detail. The mounting technologies are presented for the THD (Through Hole Mounting Device) and for the SMD (Surface Mounting Device). Special designs such as multi-chip-modules and flip-chips are described as well as the assembly processes and the testing methods and tools. Soldering technologies, such as wave-soldering and reflow-soldering, are explained.

- CO1: Explain the sustainable manufacturing of printed circuit boards and SMT devices
- CO2: Distinguish the different printed circuit boards, the respective mounting technologies and general SMD related problems in manufacturing
- CO3: Role-play the functions of SMD Manufacturing production house with customer driven objectives aligned with companies mission and vision

### **BHM3922 Internship Preparation**

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

This course provides the students the skills to prepare their mentality and documents to apply a placement for their internship semester. The topics that will be covered are such as defining self-target and motivation in the engineering profession, task understanding and delegation, priority and time management.

- CO1: Complete excellent documentation to apply for an internship placement.
- CO2: Complete excellent documentation to apply for an internship placement.
- CO3: Complete excellent documentation to apply for an internship placement.
- CO4: Define the professional target for internship as well as after graduation.

CO5: Define the professional target for internship as well as after graduation.

### **BHM3912 Internship**

**Credit Hours: 12**

**Prerequisite: BHM3922**

#### Synopsis

Students are required to undergo a minimum 6-months practical training in an industry or research area under industrial supervision. During this period, students will apply the knowledge and skills that they have learned. The hands-on experience will expose them to real engineering practice and prepare them to work in the manufacturing or related field in various industries upon graduation. The students work in current projects of the firm in the design, development, and production or distribution process. The projects deal with mechatronics or related fields and allow the practical application of university knowledge.

- CO1: Demonstrate technical skills and knowledge to be applied in the industry
- CO2: Suggest solutions to problems for related industry
- CO3: Obey the rules and etiquettes in industry
- CO4: Communicate effectively on industry experience
- CO5: Function effectively as a member to supports the efforts of others
- CO6: Search information in the broadest context of industrial experience

### **BHM3932 Internship Follow-Up**

**Credit Hours: 2**

**Prerequisite: BHM3912**

#### Synopsis

This course exposes the students to new tendencies in mechatronics engineering / technologies from the talks by several representatives from the industries. The students will select a speaker after their speech to gather more information about the topics as well as get personal connections for future career benefits. In the end the students have to prepare a report and present about the topic.

CO1: Complete a report about new technologies / tendencies in mechatronics engineering.

CO2: Complete a report about new technologies / tendencies in mechatronics engineering.

CO3: Complete a report about new technologies / tendencies in mechatronics engineering.

CO4: Present about new technologies/ tendencies in mechatronics engineering.

CO5: Present about new technologies/ tendencies in mechatronics engineering.

### **BHM4921 Engineers and Society**

**Credit Hours: 1**

**Prerequisite: None**

#### Synopsis

This course introduces the engineering profession in local industries sector, issues in local industries, ethics and public responsibility and sustainability practices in global economy

- CO1: Explain the importance of engineering practices and its professionalism with stakeholders of businesses
- CO2: Analyse the sustainability practices in engineering profession and impact to global society
- CO3: Develop a solution with stakeholders engagement

### **BHM3602 Quality Inspection**

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

This course is the application of statistical, mathematical and management methods for improving the quality and reliability of industrial products, processes and systems. Thus, the concept of basic quality tools, fundamentals of statistics, control charts for variables and attributes, fundamentals of probability and acceptance sampling systems are the key success of this course.

- CO1: Determine the measures of frequency distributions, central tendency,

dispersion and normal curve when the data are systematically gathered.

CO2: Analyze the variations that occur in the central tendency and mean of a set of observations.

CO3: Analyze the quantitative data to improve processes, develop a new product and establish statistical control.

### **BHM3313 Microcomputer Technology**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces microcomputer technology in which the students will learn about the periphery and structure of a microcontroller, assembler for the 8051 controller family, solving problems with assemblers, development of microcomputer hardware and overview on processor architecture.

CO1: Analyze the periphery and structure of microcontroller

CO2: Analyze the assembler for the 8051 controller family

### **BHM3323 Software Engineering**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course covers C++ for C programmers, object-oriented analysis and design, Unified Modelling Language and multi-layers software design. Students will design and develop software for a specific mechatronics system.

CO1: Convert C program into C++ program and develop an object-oriented C/C++ program.

CO2: Design software using the UML and multi-layer architecture.

CO3: Develop software for the specific mechatronics system.

CO4: Communicate effectively on the specific mechatronics system.

### **BHM3941 Engineering Communication**

**Credit Hours: 1**

**Prerequisite: None**

#### Synopsis

This course develops the students to write and present technical reports. They will learn about clear sentences, unified-paragraph and report writing. In addition, the students also prepare and practice oral presentations. This course requires the students to submit substantial technical reports and perform effective presentations.

CO1: Produce technical reports with proper language and format.

CO2: Present technical information effectively.

### **BHM3512 Manufacturing Quality**

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

This course familiarizes students with quality management methods, quality control tools and techniques. Students are exposed to the quality improvement process and quality management system in industry. The human factor in quality management and the requirements of ISO 9000 are also covered. Students are required to develop an effective quality management system in groups as well as performing individual engineering roles.

CO1: Construct the quality management method in manufacturing industry processes

CO2: Solve the quality problems by using statistical analysis tools and techniques for quality improvement.

CO3: Create the effective quality management system in a company

### **BHM3703 Industry 4.0**

**Credit Hours: 4**

**Prerequisite: None**

#### Synopsis

This course is a continuation of course BHM3732 PLC System. In this course the students have to develop, document, and present industrial automation software for a manufacturing system using PLC.

- CO1: Understand specific applications and functions related to automation
- CO2: Program and use the automation device of machine control systems with a PLC
- CO3: Develop a solution for an industrial automation problem with PLCs

### **BHM4102 Finite Element Analysis**

**Credit Hours: 2**

**Prerequisite: None**

#### Synopsis

This course introduces finite element methods for structural, thermal flow, electrostatic and electromagnetic problem analysis of micro electro-mechanical systems (MEMS).

- CO1: Analyze Structural Problem using finite element methods.
- CO2: Analyze Thermal Flow using finite element methods
- CO3: Analyze Electrostatic and electromagnetic problems using finite element methods.
- CO4: Analyze Complex Mechatronics problem using finite element methods.

### **BHM4904 Team Oriented Project Study**

**Credit Hours: 4**

**Prerequisite: None**

#### Synopsis

This course trains students to conduct a group work engineering project to develop a product. After the students have analysed the main problem, they independently design and determine the specifications and requirements of the product. The documents are presented in the form of a role play in which the participants act as another character, e.g. manager or customer, to discuss and improve the relevant documents. These mid-term presentations emulate industrial project team meetings with a fixed agenda, protocol, leadership, voting procedures, kick-off etc. They are followed by the evaluation phase which includes a value analysis and cost and risk assessment. After the final kick-off meeting of the team session phase, the design and manufacturing process starts. This phase is critically accompanied by more reviews and laboratory presentations. At the

end of the semester, the finished product is being publicly presented.

- CO1: Apply the product development process in the form of a team-oriented project work
- CO2: Analyze and specify products
- CO3: Provide technical documents of an engineering project
- CO4: Apply technical communication and review skills.

### **BHM4931 Final Examination**

**Credit Hours: 1**

**Prerequisite: None**

#### Synopsis

This course is a project-based course which requires students to demonstrate technical skills and personal attributes at levels which correspond with professional engineering practice. It is preferable for the project to be conducted in a related industry. Nonetheless, students can also conduct the project in the university, should there be no available industry project. Each student will be supervised by 1 UMP lecturer, 1 HKA lecturer and 1 engineer in industry (only applicable for industry projects). This course evaluates the student's competency through oral presentation (viva) session.

- CO1: Demonstrate understanding on fundamental and theoretical knowledge
- CO2: Show understanding of the problem at hand and how the proposed solution can solve the problem
- CO3: Explain the acquired knowledge
- CO4: Present the executions of the project design
- CO5: Use appropriate analysis approach to interpret the gathered data into sensible findings
- CO6: Provide critical discussions from the analysis and conclude the findings
- CO7: Deliver effective presentation on the project work
- CO8: Prepare effective slides of the project work

### **BHM3352 Electrical Actuator and Small Drives**

**Credit Hours: 2**



**Prerequisite: None**

## Synopsis

The course covers the topic of electrical actuators in the field of small drives. The focus is on electromagnetic and small power piezoelectric actuators. It is based on the physical principles, the functional principles, the design and the electrical control of various actuators. In detail, the course will cover the basics of electromagnetic fields, magnetic forces, electromagnets, the brushed and the brushless permanent magnet excited DC motor, the shunt, series and universal motor as well as piezoelectric actuators and their control treated. In addition, the calculation of analytical actuator models, in the form of laboratory exercises on the design and optimization of electromagnetic actuators will be conducted.

- CO1: Demonstrate knowledge and principle of actuator modelling and equivalent system.
- CO2: Analyse actuator equations and evaluate actuator drive systems for different operating conditions.

**BHM3342 Product Development****Credit Hour: 2****Prerequisite: None**

## Synopsis

This course covers the knowledge on product development and design to perform product development activities, process measurement and planning in order to manufacture products which meet the customer requirements at a competitive price. This covers development processes and organizations, product planning, opportunity identification, identifying customer needs and product specifications; concept generation, concept selection, concept testing and product architecture; industrial design, design for environment, design for manufacturing, prototyping and process measurement and planning.

- CO1: Analyse problems in product development and design.
- CO2: Develop solutions related to product development and design.

- CO3: Communicate effectively on issues in product development and design.

**BHM3342 Design Exercise****Credit Hour: 2****Prerequisite: None**

## Synopsis

This subject will cover the concept prototype development from the product requirement. Upon successful completion, students can design mechatronic systems and apply knowledge about the production of product requirement assemblies by learning to apply development methodological principles, to implement a given or self-developed concept in a design, to design and design mechanical components, to master a development or design task in a team, to communicate in a team and to clarify interfaces in order to be able to carry out product development within the process chain "clarification of the task up to production release". The development tasks take into account knowledge of the mechanical and electronic compatibility of mechatronic components. Students will learn and understand the basics of the development and production of printed circuit boards as well as their use in assembly and connection technology as well as the placement, soldering and testing processes in the production of flat assemblies, and apply them in the design of mechatronic systems.

- CO1: to implement a given or self-developed concept in a design, to design and design mechanical components
- CO2: understand the basics of the development and production of printed circuit boards as well as their use in assembly and connection technology as well as the placement, soldering and testing processes in the production of flat assemblies, and apply them in the design of mechatronic systems
- CO3: to communicate in a team and to clarify interfaces in order to be able to carry out product development within the process chain

**BHM3362 Industrial Concept Design****Credit Hour: 2****Prerequisite: None**

### Synopsis

Through this course, students will be able to carry out a development design project in an industrial setting, which includes identifying customer needs, planning for design, and concept generation.

Among the covered topics are:

- Understanding and analyzing tasks from development
- To collect and document all necessary information
- Technical communication and present problems / tasks
- Plan a project and meet deadlines
- Create technical research and benchmarks
- Developing solution concepts
- Document results

CO1: Describe the basic fundamentals behind development of a concept

CO2: Prepare a complete technical development report

CO3: Applying necessary software or hardware to assist in development of concept

### **BHM4003 Information System**

**Credit Hours: 3**

**Prerequisite: None**

### Synopsis

This course provides the basic information about information technology and the possibility of digital signal modification including Fourier Transformation. Students will undergo laboratory activities for development of an IT-supported system.

CO1: Describe transmission and processing of information in present-day communications technologies.

CO2: Determine and explain the principle of signal processing of HDTV material in IPTV.

CO3: Apply the fundamental and principle of signal processing in practical activities.

### **BHM4914 Bachelor Thesis**

**Credit Hours: 4**

**Prerequisite: BHM4942**

### Synopsis

This course focuses on the real professional approach to engineering studies. Students will utilise their engineering knowledge and technical skills from the previous studies to solve an engineering problem.

CO1: Demonstrate understanding on fundamental and theoretical knowledge related to the project

CO2: Show clear understanding of the problem at hand and how the proposed solution can solve the problem

CO3: Apply with a good explanation of the acquired knowledge.

CO4: Present the executions of the project design with valid results.

CO5: Use an appropriate analysis approach to interpret the gathered data into sensible findings.

CO6: Provide critical discussions from the analysis and clearly conclude the findings.

CO7: Suggest recommendations for implementation, further research and commercialization.

CO8: Communicate effectively on the project work through report and presentation.

### **Electives:**

#### **BHM3823 Hybrid Integration**

**Credit Hours: 3**

**Prerequisite: None**

### Synopsis

The course content focuses on the knowledge of hybrid manufacturing built microsystems and their thick-film circuits. Upon completion the course, the students should be able to obtain knowledge of monolithic and hybrid structures, the selection on the manufacturing process of the substrates and their usage, the increase in the packing density, the choice of suitable printing pastes, the details on the screen printing technology and the assessment as well as the use of interconnection technologies for bare semiconductors.

- CO1: Build and demonstrate fundamental knowledge on technologies in micro-mechatronics
- CO2: Develop a layout for a hybrid-integrated system by minimising the dimensions (packaging density)

### **BHM3813 Clean Room Technology**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces the need of cleanrooms in different fields of application such as micro-electronics, micro-optics, micro-mechanics in the semiconductor, pharmaceutical and food industry.

- CO1: Design a cleanroom layout for a micro-mechatronic manufacturing process
- CO2: Operate, test and monitor cleanroom condition to achieve standard required
- CO3: Evaluate and eliminate the causes/sources of contamination in the cleanroom

### **BHM3833 Microtechnology Lab**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

For the laboratory work, students should be able to independently build up the mechatronic system from the microstructures assembly. The students should be able to master the mechanical, programming and the electronic aspects of integrated circuit based systems. The practical knowledge obtained during the course should make them directly applicable to fulfill the requirement from the industry that relies on the microtechnologies application.

- CO1: Apply the micro technology and energy harvesting autonomous knowledge
- CO2: Implementing the micro energy harvesting system.
- CO3: Analyse the working principle of the micro technology based on the design and longevity of the system.

### **BHM3813 Energy Harvesting for Autonomous Microsystems**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course focuses on the competency of energy supply for autonomous microsystems. Upon completion of the course, the students should be able to use system plan autonomous energy supply and have deep understanding on the underlying technologies of harvesters, energy storage, etc. Also, the students should be able to evaluate the usability of those underlying technologies and be able to make suggestions for useful components. The ability to participate in the planning of the autonomous sensor nodes for the IOT and the emphasis on the energy impacts are the main requirements.

- CO1: Apply the knowledge that relates to the thermal harvesters, kinetic harvesters and small photovoltaic cells, energy storage and energy management circuits.
- CO2: Analyse the problem related to energy storage and energy management circuits.
- CO3: Recognise the need for and have the preparation to engage independently the operation in micro energy harvesting

### **BHM3913 Mathematical Basic of Robotic and Image Processing**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course provides an overview of robot mechanism, kinematics, motion kinematic, dynamics and planning control. Topics include robotic system overview, rotational matrices, translational matrices, homogeneous and composite matrices, D-H algorithm representation, Lagrange-Euler formulation, and robot planning and image processing techniques for the robotic system. At the end of the course, shall design the robot mathematical modeling together complete with its simulation system.

- CO1: To develop kinematic motion of the robot using DH algorithm
- CO2: To develop dynamic properties of the robot using Lagrange algorithm
- CO3: To develop trajectory planning of robotic motion
- CO4: To analyse image processing techniques for robotic applications

### **BHM3923 Rapid Prototyping and Manufacturing**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

The participants will see the development of mobile robots as development of an overall mechatronic system. Students will do this by understanding the mechatronic processes, structural optimization, material and solve manufacturing tasks by using Rapid Prototyping and Manufacturing technologies.

In successful participation

- The students can describe the basic principles of mechatronic systems
- The students master the process chains of rapid prototyping and rapid manufacturing
- The students can apply what they have learnt in the development process of a system

- CO1: Describe the basic principles of mechatronic systems
- CO2: Analyse design for rapid prototyping and manufacturing.

### **BHM3933 Control Systems Engineering 2**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

At the end of the course, students should be able to design the state space of the system from block diagram, simulation of the state space system, controllability and observability, calculation of the controller matrix, pre-filter design and observer design. Course will be accompanied with simulation software.

Contents: •Control systems in the state space  
•Setting up the state equations from the system differential equation  
•Setting up the state equations from the block diagram  
•Simulation of state space systems with MATLAB/ Simulink  
•Controllability and observability  
•Transmission function and state return  
•Calculation of the controller matrix for systems in control normal form  
•Calculation of the controller matrix for systems in any state representation  
•Pre-filter design  
•Simulation of the state control with MATLAB/Simulink  
•Observer design, Simulation with MATLAB/Simulink

- CO1: To develop state space control system
- CO2: To analyse controllability and observability
- CO3: To simulate the state space control, observer design

### **BHM3943 Robotics + Lab**

**Credit Hours: 3**

**Prerequisite: None**

#### Synopsis

This course introduces the basic foundation of mobile robot navigation. The course will start with the introduction of the common robotic system. The core of this course is to address the problem of mobile robot kinematics, dynamic and control. A robotic navigation and perception will be discussed. After completing this course, students should be able to apply the theory to develop a motion control of mobile robot navigation.

- CO1: To analyse mobile robot and autonomous system overview
- CO2: To develop kinematic of holonomic and non-holonomic system of mobile robot
- CO3: To analyse mobile robot navigation and control

## CURRICULUM STRUCTURE BACHELOR OF TECHNOLOGY IN INDUSTRIAL MACHINING WITH HONOURS

YEAR	FIRST		SECOND		THIRD		SHORT	FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND			
PROGRAMME COURSES	<b>BVM1013</b> Product Drafting and Specification	<b>BVM1054</b> Tool Setup and Refurbishment	<b>BVM2094</b> Precision and Finishing in CNC Technology	<b>BVM2013</b> Precision and Finishing in EDM And Grinding Technology	<b>BVM3214</b> Rework and Rehabilitation Of Machined Component	<b>BVM3254</b> Acts and Risk Assessment in Machining Production			
	<b>BVM1023</b> Standard Product Precision	<b>BVM1063</b> Sustainable Machining	<b>BVM2114</b> Prismatic CAD/CAM Product	<b>BVM2134</b> Complex CAD/CAM Product	<b>BVM3224</b> Surface Aesthetics of Machined Component	<b>BVM3244</b> Project Management and Supervision			
	<b>BVM1033</b> Workpiece and Cutting Tool Properties	<b>BVM1073</b> Condition Monitoring in Machining	<b>BVM2123</b> Multi Axis Machining	<b>BVM2124</b> Capstone Technopreneurship 1	<b>BVM3124</b> Capstone Technopreneurship 2	<b>BVM3234</b> Machine Maintenance	<b>BVM4026</b> Final Year Project 2	<b>BVM3212</b> Industrial Training	
	<b>BVM1043</b> Jig and Fixture	<b>BVM1083</b> Assessment of Machinability	<b>BVM3154</b> Assembly Method	<b>BVM2143</b> Heat Treatment of Machined Component					
	<b>UGE2002</b> Technopreneurship	<b>UHL2442</b> Essential English	<b>UHL2452</b> English For Vocational Communications	<b>UHC2022</b> Penghayatan Etika Dan Peradaban	<b>BVM33*4</b> Elective 1A	<b>BVM4014</b> Final Year Project 1			
	<b>UHC1012</b> Falsafah Dan Isu Semasa	<b>UHF11*1</b> Mandarin For Beginner	<b>UHF21*1</b> Mandarin For Intermediate	<b>UHS1022</b> Soft-Skills					
	<b>UQB**1</b> Co-Curriculum 1	<b>UQ*2**1</b> Co-Curriculum 2							
	<b>TOTAL CREDIT</b>	<b>17</b>	<b>17</b>	<b>18</b>	<b>18</b>	<b>16</b>	<b>16</b>	<b>6</b>	<b>12</b>
	<b>TOTAL CREDIT FOR GRADUATION</b>	<b>120</b>							

**ELECTIVE COURSES FOR  
BACHELOR OF TECHNOLOGY IN INDUSTRIAL MACHINING WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BVM3354	Tool and Die Making	4
2	BVM3364	Aerospace Machining	4
3	BVM3374	Rapid Machining	4
4	BVM3384	Human Factor Technology	4
5	BVM3394	Production Planning in Machining	4
TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION			4

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	To produce machining technologists that perform related work including machinist, design, manufacturer, maintenance, facility manager and production manager.
PEO2	To produce technopreneurship in machining related technology
PEO3	To produce relevant, respected and referred professionals in machining technology.

**PROGRAMME LEARNING OUTCOMES (PLO)**

PLO1	Apply knowledge of technology fundamentals to broadly-defined procedures processes, systems and methodologies in Machining technology (Knowledge).
PLO2	Able to suggest and apply latest tools and techniques to solve broadly-defined problems (Practical Skills and High Technology).
PLO3	Demonstrate strong analytical and critical thinking skills to solve broadly-defined problems in Machining technology (Analytical and Critical Thinking and Scientific Approach).
PLO4	Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large (Communication Skills).
PLO5	Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices (Social and Responsibility in Society and Technologist Community).
PLO6	Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists (Lifelong learning and information management).
PLO7	Demonstrate an awareness of management and technopreneurship practices in real perspective (Entrepreneurs and Management Skills).
PLO8	Demonstrate professionalism and social and ethical consideration (Ethics and Professionalism).
PLO9	Demonstrate leadership quality, mentoring and work effectively in diverse teams (Teamwork and Leadership).

## **COURSE SYNOPSIS FOR DEGREE PROGRAMME 2022/2023**

### **BACHELOR OF TECHNOLOGY IN INDUSTRIAL MACHINING WITH HONOURS**

#### **BVM1013 Product Drafting and Specification**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

The course introduces the principle of drafting specification. Important topics like geometrics, sectional views and multi-view drawing will be covered. Lettering, interpreting tolerance and dimensioning, as well as drafting assembly drawings will also be covered. Students will also learn how to interpret drawings.

By the end of semester, students should be able to:

- CO1: Examine, analyse, interpret and assess the technical drawing.
- CO2: Deliver information via the set of drawings from engineering parts.
- CO3: Draft the product to be machined according to the standard of engineering drawing

#### **BVM1023 Standard Product Precision**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This course covers three key areas; dimensional metrology, measurement analysis, and surface / texture measurement. In dimensional metrology, students will be exposed to three types of measurements; linear, angle and geometrical. In the measurements analysis, it will require students to describe the standard Measurement, measurement process, process capability, measurement errors, limits, tolerances and fits. In surface/texture measurement, students will perform the measurement of surface texture. This course

is equivalent to Geometric, Dimensioning and Tolerance in other engineering fields.

By the end of semester, students should be able to:

- CO1: Explain the basic quality principles and practices, quality solving techniques and product reliability related to manufacturing process
- CO2: Perform suitable measurement methods for a given issue
- CO3: Solve the manufacturing process quality problem using quality solving techniques in a group work

#### **BVM1033 Workpiece and Cutting Tool Properties**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This course covers types, setup, applications and specifications of common cutting tools and workpiece materials that frequently applied in industry.

By the end of semester, students should be able to:

- CO1: Describe the common cutting tools and workpiece material that are being applied in automotive, aerospace and medical.
- CO2: Manufacture cutting tool and / or workpiece material from powder metallurgy and casting process.
- CO3: Relate the usage of cutting tools and workpiece materials in the specific application in industry.

#### **BVM1043 Jig and Fixture**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This course introduces students to jig and fixture. It starts with types and functions of jig and fixture. In addition, students will be exposed to knowledge about classification of jigs and fixtures for selected operations. This

course also will introduce the student about the principles and analysis of a tool design in jig and fixture application. In this course, the tool drawing knowledge is important to design jigs and fixtures.

By the end of semester, students should be able to:

- CO1: Perform to fabricate components for jig and fixture with the specific application in machining.
- CO2: Explain the types of jigs and fixtures, materials used, actuation method, components of jigs and fixtures
- CO3: Coordinate a task to fabricate jig and fixture assembled with any multicomponent. .

### **BVM1054 Tool Setup and Refurbishment**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

The course introduces why the selection of the appropriate cutting tools and cutting fluids are essential in metal cutting operations to reduce the heat and friction produced during material removal operations and how the selection, setup and applications affect the quality, accuracy, efficiency and productivity of the workpiece produced.

By the end of semester, students should be able to:

- CO1: Identify the importance specification of cutting tool design for turning, milling and drilling operations.
- CO2: Perform the cutting tool setup for turning, milling and drilling operations.
- CO3: Propose the usage of refurbished cutting tools in machining and other applications.

### **BVM1063 Sustainable Machining**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This course provides an overview on current sustainable machining. Its topics cover the concept in cutting tool management, lubrication strategy, optimization, economic, environmental dimensions. The course also covers design of experiments in machining trials.

By the end of semester, students should be able to:

- CO1: Describe the concept of green manufacturing and sustainability in machining practices.
- CO2: Relate the sustainable issues and acts in the machining industry.
- CO3: Evaluate the principles and sustainability of using minimum resources for cost and energy saving.

### **BVM1073 Condition Monitoring in Machining**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This course exposes the student to performing condition monitoring in determining the condition of machinery while in operation. Monitoring conditions in machining can be categorized into three aspects: Knowing what to listen for; How to interpret it; When to put this knowledge to use. Understanding this course enables the repair of problem components prior to failure. Condition monitoring not only helps plant personnel reduce the possibility of catastrophic failure but also allows them to order parts in advance, schedule manpower, and plan other repairs during the downtime.

By the end of semester, students should be able to:

- CO1: Relate the application of design, maintenance, process and inspection in condition monitoring.
- CO2: Elaborate the potential of machining experts in condition monitoring.
- CO3: Develop skills that are required to be applied in condition monitoring.



**BVM1083 Assessment of Machinability****Credit Hour: 3****Prerequisite: None**

## Synopsis

This course provides students with the measurement of machining performances, i.e. machinability. Machinability is an indicator of one engineering material on how easy or difficult to be machined to achieve acceptable performances. Technologists are often challenged to improve machinability without harming material performance, which are focused on machining efficiency and productivity. However, unlike most material properties, machinability cannot be simplified into a unique work material property, but considering as a resultant property of the machining system which is mainly affected by work material's physical properties, heat treatment processes, work-hardening behavior, as well as cutting tool materials, tool geometry, machining operation type, cutting conditions and cutting fluids. In addition, factors and methods for improving machinability are also covered in this course.

By the end of semester, students should be able to:

- CO1: Define factors that are governed or influenced on machinability.
- CO2: Measure the machinability of the machining process.
- CO3: Organizing various methods of improvement for machinability.

**BVM2094 Precision and Finishing in CNC Technologies****Credit Hour: 4****Prerequisite: None**

## Synopsis

This course provides students with concepts and practices in CNC machining that are computer programming of CNC milling and

turning with specific processes such as drilling, tapping, boring, grooving, facing, pocketing, radius forming, angular cutting, and threading. Emphasis is on programming and production of parts, including investigation in 2 and 3-axis programming techniques.

By the end of semester, students should be able to:

- CO1: Develop programs by using a coordinate system for milling and turning by using ISO coding systems.
- CO2: Recognize the capabilities of 2, 3 axis CNC machining.
- CO3: Manage production by using CNC machines to produce components.

**BVM2103 Precision and Finishing in EDM and Grinding Technology****Credit Hour: 3****Prerequisite: None**

## Synopsis

This course introduces students to EDM and grinding technologies. It starts with an introduction of EDM and grinding technologies. In addition, students will be exposed to knowledge about classification of EDM and grinding technologies for selected operations. This course also will introduce students to identify the principles and analysis of a tool design and tool manufactured in both machine applications. In this course, the tool drawing is important to students to operate and manage the machine in the laboratory. The content in this lesson plan will guide the lecturer on the presentation.

By the end of semester, students should be able to:

- CO1: Recognize the capabilities of EDM and Grinding Process.
- CO2: Develop programs by using a coordinate system for EDM and Grinding for machining solutions.
- CO3: Manage production by using EDM and Grinding machines to produce components.

**BVM2114 Prismatic CAD / CAM Machining****Credit Hour: 4****Prerequisite: None**

## Synopsis

This course covers complete integration of design, and manufacturing simplifies the creation of manufacturing components and geometry. The topics involved feature-based and geometry-based programming, for easy adaptability to design changes. Students will practice predictable and reliable machining to speed up delivery of products to customers. Other skills that can be obtained include capture and reuse your machining practices to streamline and standard manufacturing methodologies. This course provides a complete solution, from design through NC code generation. NC program creation, process documentation, post-processing and tool-path verification and simulation.

By the end of semester, students should be able to:

- CO1: Design the product by using the CAD / CAM system
- CO2: Apply the method of converting CAD / CAM design to the CNC programs
- CO3: Manage the different procedures in CNC programming

**BVM2123 Multi Axis Machining****Credit Hour: 3****Prerequisite: None**

## Synopsis

This course gives in-depth knowledge to students regarding multi axis machining. As compared to basic CNC machining which comprises 3 linear axes namely X, Y and Z axis, multi-axis machining gives further capability to machine complex parts with the additional rotary axis A, B and C, as well as mill-turn and turn-mill capability. Understanding machines configuration will be

key to avoid collision during machining. Students will be introduced to various machine configuration and machine kinematics to have a better understanding of machine tools to create effective and safe CNC machining programs.

By the end of semester, students should be able to:

- CO1: Create machining program for complex parts that require multi axis machining
- CO2: Differentiate different types of machine configuration and machine kinematics
- CO3: Present sources and possibility of machine collision during machining

**BVM2124 Technopreneur Capstone 1****Credit Hour: 4****Prerequisite: None**

## Synopsis

Entrepreneurs need money to start and to grow their business. It is important to understand how revenue is generated, how to source for funds, how to control cash flow, how to assess the success of the company in monetary terms, and how to value a company for various purposes. The course exposes students to the various financial aspects relating to new ventures. These include approaches to secure start-up capital and venture financing. Students learn about the basic accounting, essential financial indicators, the funds available, the different categories of investors, the importance of intellectual property in securing finance, the financial details to be included in a business plan required for investment purpose, valuation of the company and the art of negotiation with investors.

By the end of semester, students should be able to:

- CO1: Apply various financial indicators & tools to prepare for financial information for a new business venture

- CO2: Acquire skills to analyze financial statements
- CO3: Present financial information for new business
- CO4: Display the art of negotiation with investors

### **BVM2134 Complex CAD CAM Product**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

This course is the continuity from the course of Prismatic CAD CAM Product. Complex CAD CAM products will be produced by using either 3, 5 or 9 axis CNC machines. The topics involved with construction views; cross section surface construction; trim plane surface; extruded surface; surface of revolution; drive curve surface construction; surface fillet construction; extending surface; composite surface construction.

By the end of semester, students should be able to:

- CO1: Develop the geometric features and method to design complex CAD/ CAM
- CO2: Apply the method of converting to the CNC programs
- CO3: Distinguish the different procedures in NC programming for complex product

### **BVM2143 Heat Treatment and Rework of Machined Component**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This course will discuss the concept and application of heat treatment on various types of metal. The topics involved with the main alloying element that affected the hardenability of steel. The students will be exposed to the common heat treatment practice in industry. Students will also practice the quality control evaluation after heat

treatment. Several advanced heat treatment processes also will be discussed.

By the end of semester, students should be able to:

- CO1: Conduct heat treatment or rework to alter the properties of selected steel
- CO2: Propose the methods and procedures that can be utilized for rework or heat treatment process
- CO3: Verify whether reworked or heat-treated parts are ready for use

### **BVM3124 Technopreneur Capstone 1**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

This course comprises two parts: in the first part, organization and human resource management are introduced; in the second part, the focus is on writing a convincing business plan to attract venture capital investment. When an enterprise company takes shape and grows, more people will be hired, proper organization, team building and human resource management will become important issues. In this course, students will be exposed to the various organizational aspects relevant to new ventures and established companies. These include the pros and cons of the unique organization structures, conflicts that may arise among employees, and approaches to building powerful teams. Human resource management techniques will also be introduced and discussed. In the second part of the course, the business model canvas will be described listing the connections among the different components of a business. The value of a business plan and the techniques of writing a business plan will be introduced.

By the end of semester, students should be able to:

- CO1: Apply the business model canvas incorporating human and financial elements

- CO2: Acquire skills to resolve organizational conflicts
- CO3: Write a convincing business plan
- CO4: Evaluate vital organizational behaviours necessary to grow a new venture
- CO5: Motivate all stakeholders and build a cohesive venture team

### **BVM3154 Assembly Method**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

This course introduces students to assembly methods. It starts with types and functions of joining techniques in metal and plastic parts. In addition, students will be exposed to knowledge about process assembly for metal and plastic parts. This course also will introduce students to design for manufacturing and assembly applications. In this course, the principle of assembly method is important to students to design step by step of assembly.

By the end of semester, students should be able to:

- CO1: Develop of product by assembly component manufacture various technique
- CO2: Present the possibility to assemble components by using various techniques
- CO3: Organize the components that can be assembled by design for manufacturing assembly (DMFA) approach

### **BVM3212 Industrial Training**

**Credit Hour: 12**

**Prerequisite: None**

#### Synopsis

Industrial training is a compulsory component for degree program students at Universiti

Malaysia Pahang (UMP). The experience and skills gained from a period of placement can be invaluable and provide the advantage to the students when applying for employment after graduation. During the training period with the relevant industry, students are expected to be involved in the following areas of training to achieve the underlying objectives: Manufacturing, production process and/or its optimization process, mechanical design and production, maintenance and repair of equipment, product testing and quality control.

By the end of semester, students should be able to:

- CO1: Solve technology related problems using methods, tools and techniques learnt throughout the training.
- CO2: Explain effectively with the technical community and produce technical reports and presentations.
- CO3: Demonstrate social ethics and professionalism in technology practice.

### **BVM3214 Rework and Rehabilitation of Machined Components**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

This course gives an exposure on rework of machined parts and rehabilitating machined components which are out of tolerance because of wear and tear. Rework is required when machined parts are under machined and still have unremoved materials due to tool wear during machining. Thus, rehabilitation of parts is required when a machined part is out of tolerance after servicing its purpose in the field. Students will gain an understanding of rework and rehabilitation and be aware of its purposes in manufacturing.

By the end of semester, students should be able to:

- CO1: Identify parts that can be reworked or rehabilitated

- CO2: Propose the methods and procedures that can be utilized for rework and rehabilitation process
- CO3: Verify whether reworked or rehabilitated parts are ready for use

**BVM3224 Surface Aesthetics of Machined Component**  
**Credit Hour: 4**  
**Prerequisite: None**

Synopsis

This course covers various types of coating methods for performance and aesthetics purposes of machined components. It covers the fundamentals of coating technologies, testing and procedures of each coating method.

By the end of semester, students should be able to:

- CO1: Propose the suitable surface treatment process for suitable application.
- CO2: Organize a process to be applied to treat the surface from machining to coating process.
- CO3: Present the benefit of fine surface finish of machined components to reduce operational cost.

**BVM3234 Machine Maintenance**  
**Credit Hour: 4**  
**Prerequisite: None**

Synopsis

The student will be exposed to the maintenance technique, trouble-shooting and fault diagnosis for mechanical equipment. Among the basic maintenance methods are: condition based monitoring, vibration analysis, alignment dynamic balancing and mechanical seals. Students also will also learn about trouble-shooting and maintenance of various machines and components such as valve, pump, compressor and gear. The essential

steps of disassemble, check, trouble-shoot, repair and reassemble of mechanical components will be stressed in this course.

By the end of semester, students should be able to:

- CO1: Present the different techniques in machine maintenance.
- CO2: Propose preventive maintenance program with consideration of cost, manpower and time.
- CO3: Demonstrate problem solving of real life conditions regarding machine maintenance issues.

**BVM3244 Project Management and Supervision**  
**Credit Hour: 4**  
**Prerequisite: None**

Synopsis

This course embraces a broad basic overview and principles of project management which has become central to operations in manufacturing enterprises throughout five stages of managing project; initialization, planning, execution, control and closing.

By the end of semester, students should be able to:

- CO1: Present the case study that exhibits an excellent project manager.
- CO2: Analyzing the main factors influencing project management outcome with consideration of professionalism and ethics.
- CO3: Develop project management skills through theoretical understanding and practical application of the project management principles.

**BVM3254 Acts and Risks Assessment in Machining Production**  
**Credit Hour: 4**  
**Prerequisite: None**

### Synopsis

The course will expose students to health and safety and work in safer and healthier ways. Students will be exposed to the related act. By the end of semester, students should be able to:

- CO1: Be able to assess, analyse and interpret risks to the health and safety
- CO2: Able to plan, organise, control, monitor and review the preventive and protective.
- CO3: Implementing operational risk management (ORM)

### **BVM4014 Final Year Project 1**

**Credit Hour: 4**

**Prerequisite: None**

### Synopsis

The student needs to plan and implement the project individually that is related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to the topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objectives of the project and present it in the report.

By the end of semester, students should be able to:

- CO1: Explain the problem, objectives and scope of the project associated with the industrial or community needs.
- CO2: Use relevant theory to produce a solution.
- CO3: Choose a proper methodology
- CO4: Present the preliminary findings in the oral and written forms effectively.

### **BVM4026 Final Year Project 2**

**Credit Hour: 6**

**Prerequisite: None**

### Synopsis

This is the second part of the Bachelor Degree Project. Students are expected to continue the project performed in the Bachelor Degree Project until completion. At the end of the semester, students are required to submit the Bachelor Degree Project report and present their projects for assessment.

By the end of semester, students should be able to:

- CO1: Perform project implementation.
- CO2: Interpret data in a meaningful form using relevant tools.
- CO3: Work independently and ethically.
- CO4: Present the results in the oral and written forms effectively.

## CURRICULUM STRUCTURE BACHELOR OF TECHNOLOGY IN WELDING WITH HONOURS

YEAR SEMESTER	FIRST		SECOND		THIRD		SHORT	FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND			
BACHELOR OF TECHNOLOGY IN WELDING WITH HONOURS COURSES	BVW1014 Safety in Welding	BVW1043 Product Design in Welding	BVW2074 Imperfection in Welding and Testing	BVW2154 Capstone Capstone Entrepreneurship 1	BVW3154 Capstone Capstone Technopreneurs hip 2	BVW3193 Cyber Physical System in Welding	BVW3286 Final Year Project 2	BVW4212 Industrial Training	
	BVW1024 CAD and Welding Graphic	BVW1054 Welding Documentation	BVW2084 Material Behaviour in Welding	BVW2114 Computer Aided Analysis	BVW3114 Economic of Welding and Procurement	BVW3204 Reclamation in Welding			
	BVW1034 Metal Fabrication Process	BVW1064 Non-conventional Welding Process	BVW2094 Safety Management	BVW2124 Electrical Welding Equipment	BVW3124 Welding Quality Assurance	BVW3214 Managing Production/ Supervisory			
	UGB**1 Co-Curriculum 1	UQ*2**1 Co-Curriculum 2	BVW2104 Welding Design Analysis	BVW2134 Non Destructive Test	BVW3**4 Elective	BVW3284 Final Year Project 1			
	UHC1012 Falsafah Dan Isu Semasa	UHL2442 Essential English	UHL2452 English for Vocational Purpose	UHC2022 Penghayatan Etika Dan Peradaban					
	UGE2002 Technopreneurship	UHF2111 Mandarin for Beginners	UHF2411 Mandarin for Intermediate	UHS1022 Soft-Skills					
		17	15	19	20	16	15	6	12
	120	TOTAL CREDIT FOR GRADUATION							

**ELECTIVE COURSES FOR  
BACHELOR OF TECHNOLOGY IN WELDING WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BVW3314	Welder Inspector	4
2	BVW3324	Welder Specialist	4
3	BVW3334	NDT Inspector	4
TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION			4

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	To produce welding technologist that perform related work including welder, design, manufacturer, maintenance, facility manager and production manager
PEO2	To produce technopreneurship in welding related technology
PEO3	To produce relevant, respected and referred professionals in welding technology

**PROGRAMME OUTCOMES (PO)**

PO1	Apply the knowledge of technology fundamental to broadly-defined procedures, processes, systems and methodologies in the field of study.
PO2	Propose and employ current tools and techniques to resolve broadly-defined problems.
PO3	Demonstrate deep investigative and significant thinking abilities to solve broadly-defined problems in the field of study.
PO4	Communicate effectively and flexibly in oral and written language for social, academic and professional purposes.
PO5	Illustrate the understanding of corresponding issues related to the society and the subsequent responsibilities to the broadly-defined technology practices.
PO6	Acknowledge the requirement of professional establishment and to employ independent continuing learning in specialist technology.
PO7	Illustrate consciousness of management and technopreneurship routine in real perspective.
PO8	Illustrate ethical awareness and professionalism.
PO9	Illustrate leadership character, mentoring and work efficiently in diverse teams.



## **COURSE SYNOPSIS FOR DEGREE PROGRAMME 2022/2023**

### **BACHELOR OF TECHNOLOGY IN WELDING WITH HONOURS**

#### **BVW1014 Safety in Welding**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

The aim of this course is to expose students on safety practices and procedures. The students are required to identify types of hazards that may incur in industries especially related to welding processes. The students are required to understand equipment, instruction and carefully review the material safety data sheets.

By the end of semester, students should be able to:

- CO1: Identify welding hazards that impact the safety, health, and environment at the working area.
- CO2: Explain the welding risk control by various procedures in the working environment.
- CO3: Control method or procedure to minimize or remove the impact of possible hazards in the working environment.

#### **BVM1024 CAD and Welding Graphic**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

The course will provide students with an understanding of the importance of engineering graphics as a communication tool especially for welding applications. Students will be exposed to geometry drawing, orthographic drawing, section view, isometric drawing, assembly drawing, dimension, tolerance, welding symbols and standard codes using manual sketches and computer aided design (CAD) software.

By the end of semester, students should be

able to:

- CO1: Explain the engineering drawings include welding symbols and standard codes.
- CO2: Construct technical drawing using manual sketching and computer aided design.
- CO3: Communicate by using engineering drawings for welding applications.

#### **BVW1034 Metal Fabrication Process**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

This course is to equip students with the knowledge of metal fabrication and welding technology to improve manufacturing expertise in providing human capital development at par with global technological developments.

By the end of semester, students should be able to:

- CO1: Organizing themselves either its individuals or in groups during the project generating process.
- CO2: Manipulating the basic principles and scientific processes and materials to produce products with reasonable judgment.
- CO3: Demonstrate understanding of the concept and use of the terms contained in metal fabrication and welding technology.

#### **BVW1043 Product Design in Welding**

**Credit Hour: 3**

**Prerequisite: None**

#### Synopsis

This subject covers product design problems, formulating design problems, concept design, configuration design, parametric design, product costing, project and teamwork especially for welding product application.

By the end of semester, students should be able to:

- CO1: Apply an appropriate design method of developing a practical solution of product design problem.
- CO2: Develop a practical design solution through a systematic investigation of the product design problem especially welding product application.
- CO3: Communicate effectively in written, oral and visual including teamwork.

### **BVW1054 Welding Documentation**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

The job of welding inspection requires that the inspector possess or have access to a great deal of information and guidance. Welding inspectors cannot evaluate a welded structure without information from the designer or the welding engineer regarding weld quality. The inspector also needs to know when and how to evaluate the welding. To satisfy this need, there are documents available to be performed. Many of these documents also include acceptance criteria with codes and standards. The course identifies the competence required in welding design, welding joint detail and welding symbol according to AWS/BS/ISO standard.

By the end of semester, students should be able to:

- CO1: Apply welding procedure qualification and welder qualification Interpret various types of drawing design and symbol in welding according to related standards.
- CO2: Construct various types of drawing design and symbols in welding according to related standards.
- CO3: Demonstrate type of drawing design and symbol in welding as required according to related standards.

### **BVM1064 Non-conventional welding process**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

This subject is to provide students with welding processes that are not commonly used in the current industries that can be categorized as new or advanced welding technology. Students will be exposed to all welding processes and should be able to perform process selection when dealing with the special and complex demand of welding work.

By the end of semester, students should be able to:

- CO1: Identify types of joining processes applied in the manufacturing sector.
- CO2: Explain the characteristics of joining in terms of process, equipment and setup.
- CO3: Practice the joining processes using certain equipment to make a variety of joints.

### **BVM2074 Imperfection in Welding and Testing**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

The course will provide students with knowledge of identifying types of defects and the strategy of controlling the imperfection. The students will also be required to perform a mechanical destructive test that is tensile, bending, copy and hardness test. The competence required for checking fabrication materials, structural alignment & dimensions, checking welding quality (welding defect / distortion and weld repair).

By the end of semester, students should be able to:

- CO1: Apply welding inspection method.
- CO2: Implement the characteristics of metal properties and destructive testing.
- CO3: Analyse the inspection and other NDE methods.

### **BVM2084 Material Behaviour in Welding**

**Credit Hour: 4**

**Prerequisite: None**

## Synopsis

This course describes the materials used in engineering. Scope covers Materials introduction; latest developments in materials, introduction to metal, metal forging. Metal structure; scale relationship with nature, and phase diagram. This course also will provide the students with understanding of the Microstructure development with heat treatment and mechanical properties. The students will be exposed to light alloy processing and diffusion processes with microstructural appearance on thermal and mechanical properties. This course also covers the knowledge of the ceramic classification, polymer classification and composite on microstructure relationship and mechanical properties.

By the end of semester, students should be able to:

- CO1: Ability to classify metals based on generic properties, structural relationships with properties, especially the emergence of microstructures by heat treatment methods for the metal class.
- CO2: Understand the behavior of structural in fusion welding and testing of materials welded joints.
- CO3: Identifying the classification of composite and ceramic based on the testing and the microstructure.

**BVW2094 Safety Management****Credit Hour: 4****Prerequisite: None**

## Synopsis

Safety management is a course that is designed to provide knowledge for managing activities in the business workplace that apply a comprehensive management system designed to manage safety elements in the workplace. It includes acts, policy, objectives, plans, risk assessment, procedures,

organisation, responsibilities and other measures. This is important to prevent accidents, injuries and other impacts to the organisation that shows the role of management that focuses to deter such catastrophic events.

By the end of semester, students should be able to:

- CO1: Explain the different requirements and regulations of the Factory and Machinery Act, Occupational Safety and Health Act.
- CO2: Conduct hazard identification and risk assessment in the workplace.
- CO3: Construct preventive and control techniques according to the acts pertinent to Occupational Safety and Health.

**BVM2104 Welding Design Analysis****Credit Hour: 4****Prerequisite: None**

## Synopsis

The subject covers: Static: General principle, Force vector and Equilibrium of Particle; Mechanics: Principle of Stress & Strain, Torsion; Mechanics: Pure Bending and analysis and design of beams for bending; Welded design Program; Design Equations; Welded design Considerations; Design for welded joint; Weld joint design.

By the end of semester, students should be able to:

- CO1: Describe basic concepts and fundamental principles of mechanical applications.
- CO2: Apply basic concepts and fundamental principles to solve design for welding applications.
- CO3: Analyze basic problems in design considerations for welding.

**BVW2114 Computer Aided Analysis****Credit Hour: 4****Prerequisite: None**

## Synopsis

This course will empower the students with fundamental knowledge and technical skills of 3D solid modeling skills using industry-proven 3D mechanical CAD software. The students will learn about the different techniques for creating solid models and surfaces with emphasis on design intent. The students also will be exposed to the introduction to FEA structure/stress analysis, FEA application for weld product (welding connection analysis). The course includes hands-on exercises and best practice methods for students during the drafting stage, part, assembly (weld product) and Finite Element Analysis (weld product). By the end of semester, students should be able to:

- CO1: Apply fundamental sketching and feature modeling, build feature based models of parts and assemblies for easy editing.
- CO2: Produce document design intent of parts and assemblies (include weld design) in manufacturing drawings.
- CO3: Analyse basic stress analysis for welding connections.

### **BVW2124 Electrical Welding Equipment**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

This subject is aimed to provide the students with the understanding of static and dynamic characteristics of the electric arc and its associated power characteristics. Students will learn the basic principles, methods and circuit components that control operating power and the volt-ampere characteristics in electrical resistance and arc welding. Through that students will gain knowledge of the operating principles of Alternators, D.C. generators and motors used for welding.

By the end of semester, students should be able to:

- CO1: Explain the physical phenomenon occurring in the arc and the types of forces and metal transfer in the arc

based on measurements of power source characteristics.

- CO2: Select the right choice of diode material, thyristors and inverters based on the understanding of the basic principles and methods for controlling the volt-ampere characteristics of the electric welding machines.
- CO3: Measure the welding current, voltage, temperature, load and displacement using equipment such as clamp meter, LVDT, arc welding analyzer and resistance welding monitors.

### **BVW2134 Non Destructive Test**

**Credit Hour: 4**

**Prerequisite: None**

#### Synopsis

This course introduces the basic principles of non-destructive testing and the methods of non-destructive testing that are widely used in the industry, which are Visual Inspection, Penetrant Test, Magnetic Particle Testing, Eddy Current Testing, Ultrasonic Testing and Radiographic Testing. This course also covers the execution, evaluation and interpretation of each NDT technique. The advantages, limitations and main application of each NDT technique are also provided.

By the end of semester, students should be able to:

- CO1: Explain the current basic and some advanced principles of Non-Destructive Testing (NDT) techniques to satisfy complex engineering problems.
- CO2: Select and propose suitable NDT techniques based on their analysis on engineering problems that fulfill the standard practice.
- CO3: Develop the ability to communicate effectively using available resources to disseminate knowledge of NDT techniques in relation to industrial problems.

### **BVW2154 Capstone Technopreneurship 1**

**Credit Hour: 4**

**Prerequisite: None**

## Synopsis

Entrepreneurs need money to start and to grow their business. It is important to understand how revenue is generated, how to source for funds, how to control cash flow, how to assess the success of the company in monetary terms, and how to value a company for various purposes. The course exposes students to the various financial aspects relating to new ventures. These include approaches to secure start-up capital and venture financing. Students learn about the basic accounting, essential financial indicators, the funds available, the different categories of investors, the importance of intellectual property in securing finance, the financial details to be included in a business plan required for investment purpose, valuation of the company and the art of negotiation with investors.

By the end of semester, students should be able to:

- CO1: Apply various financial indicators & tools to prepare for financial information for a new business venture.
- CO2: Acquire skills to analyze financial statements.
- CO3: Present financial information for new business.
- CO4: Display the art of negotiation with investors

### **BVW3114 Economic of Welding and Procurement**

**Credit Hour: 4**

**Prerequisite: None**

## Synopsis

The aim of this course is to provide participants with a clear understanding of the principles of effective procurement by utilising the capabilities to plan, implement, and evaluate a sourcing process appropriate to the value/ risk of the joining technology, materials/ part/ equipment being procured, communication and negotiation skills, and

capacity to manage strategic supply, services and consultancy contracts. Besides is to acquire knowledge in welding economics in the selection of process, consumables and workpiece material.

By the end of semester, students should be able to:

- CO1: Explain the importance of effective costing and the factors influencing welding costs.
- CO2: Calculate welding costs that include machine, material and labor.
- CO3: Record of transactions in journal and ledgers, trial-balance and preparation of final account.

### **BVW3124 Welding Quality Assurance**

**Credit Hour: 4**

**Prerequisite: None**

## Synopsis

This subject provides students with knowledge related to welding quality assurance. They will be taught with various topics covering Introduction to Welding Quality Assurance, Quality System Management and Responsibilities, Quality Assurance Planning, Welding Quality Standards, Inspections and Tests, Statistical Process Control, Non Conformances and Corrective Actions, Preventive Actions, Quality Audits, Records and Documents Control.

By the end of semester, students should be able to:

- CO1: Design a plan for quality assurance and control in the welding manufacturing process using according specifications and standards.
- CO2: Demonstrate the procedure and inspection techniques related to welding assurance and control.
- CO3: Apply creative thinking in problem solving to solve the problems associated with welding assurance and control.

**BVW3154 Capstone Technopreneurship 2**  
**Credit Hour: 4**  
**Prerequisite: None**

Synopsis

This course comprises two parts: in the first part, organization and human resource management are introduced; in the second part, the focus is on writing a convincing business plan to attract venture capital investment. When an enterprise company takes shape and grows, more people will be hired, proper organization, team building and human resource management will become important issues. In this course, students will be exposed to the various organizational aspects relevant to new ventures and established companies. These include the pros and cons of the unique organization structures, conflicts that may arise among employees, and approaches to building powerful teams. Human resource management techniques will also be introduced and discussed. In the second part of the course, the business model canvas will be described listing the connections among the different components of a business. The value of a business plan and the techniques of writing a business plan will be introduced. By the end of semester, students should be able to:

- CO1: Apply the business model canvas incorporating human and financial elements
- CO2: Acquire skills to resolve organizational conflicts
- CO3: Write a convincing business plan
- CO4: Evaluate vital organizational behaviours necessary to grow a new venture
- CO5: Motivate all stakeholders and build a cohesive venture team

**BVW3193 Cyber Physical System in Welding**  
**Credit Hour: 3**  
**Prerequisite: None**

Synopsis

The aim of this course is to provide participants with a clear understanding of the potential application of cyber-physical systems (CPS) in the welding industry. Competency in applying CPS technology, both with standalone and built-in CPS in analysis of welding parameters (e.g. current, temperature) and welding outputs (e.g. fume composition, welding bead) is thought for improving the marketability of the graduates in the era industrial revolution 4.0.

By the end of semester, students should be able to:

- CO1: Explain the added value that can be achieved through application of CPS in the welding process.
- CO2: Demonstrate effectively the appropriate CPS tools in acquiring process variables in real time.
- CO3: Criticise the logged data acquired from conventional and non-conventional welding techniques.

**BVW3204 Reclamation in Welding**  
**Credit Hour: 4**  
**Prerequisite: None**

Synopsis

The aim of this subject is to acquire knowledge and to solve problems associated with failure and to update personnel on the latest technology to ensure the welded subject would be maintained in good operating condition and at low maintenance cost.

By the end of semester, students should be able to:

- CO1: Repair the quality of welding which will benefit the industry in terms of productivity and savings.
- CO2: Develop the skills to carry out practical feasible repair techniques maintaining low cost.
- CO3: Selection of repair welding and apply techno-economics for practical problems.

**Supervisory**  
**Credit Hour: 4**  
**Prerequisite: None**

Synopsis

Welding production planning is another very important element in a manager's responsibility to allocate the resources required to achieve cost-effectiveness in welding processes. Furthermore, this subject shall cover managers' responsibility to maintain equipment and consistently meet throughput requirements with a level of quality that conforms to the required standards.

By the end of semester, students should be able to:

- CO1: Identify the standardization of the welding procedure.
- CO2: Identify required maintenance of equipment and record.
- CO3: Explain supervisor scope to minimize reject, scrap and rework reduce rework analyze the quality management system.

**BVW3284 Final Year Project 1**  
**Credit Hour: 4**  
**Prerequisite: None**

Synopsis

The student needs to plan and implement the project individually that is related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve the problems related to the topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objectives of the project and present it in the report.

By the end of semester, students should be able to:

- CO1: Explain the problem, objectives and scope of the project associated with the industrial or community needs.

- CO2: Use relevant theory to produce a solution.
- CO3: Choose a proper methodology
- CO4: Present the preliminary findings in the oral and written forms effectively.

**BVW3286 Final Year Project 2**  
**Credit Hour: 6**  
**Prerequisite: None**

Synopsis

This is the second part of the Bachelor Degree Project. Students are expected to continue the project performed in the Bachelor Degree Project until completion. At the end of the semester, students are required to submit the Bachelor Degree Project report and present their projects for assessment.

By the end of semester, students should be able to:

- CO1: Perform project implementation.
- CO2: Interpret data in a meaningful form using relevant tools.
- CO3: Work independently and ethically.
- CO4: Present the results in the oral and written forms effectively.

**BVW4212 Industrial Training**  
**Credit Hour: 12**  
**Prerequisite: None**

Synopsis

Industrial training is a compulsory component for degree program students at Universiti Malaysia Pahang (UMP). The experience and skills gained from a period of placement can be invaluable and provide the advantage to the students when applying for employment after graduation. During the training period with the relevant industry, students are expected to be involved in the following areas of training to achieve the underlying objectives: Manufacturing, production process and/or its optimization process, mechanical design and production, maintenance and repair of equipment, product testing and quality control.

By the end of semester, students should be

able to:

- CO1: Solve technology related problems using methods, tools and techniques learnt throughout the training.
- CO2: Explain effectively with the technical community and produce technical reports and presentations.
- CO3: Demonstrate social ethics and professionalism in technology practice.



## CURRICULUM STRUCTURE DIPLOMA IN MANUFACTURING ENGINEERING TECHNOLOGY

YEAR	1					2	
SEMESTER	FIRST	SECOND	THIRD	FORTH	FIFTH	SIXTH	
COURSES	UHC2022 Penghayatan Etika dan Peradaban	DRP1123 Materials Science	DRP1333 Thermodynamic	DRP2213 Dynamics	DRP2623 Industrial Automation & Robotics	DRP3910 Industrial Training	
	DUF1113 Physics	DRP1423 Computer Aided Design & Drafting	DRP1522 Electrical Principles	DRP2612 Metrology	DRP2123 Manufacturing System	UQB1012 Co-curriculum	
	DUM1113 Basic Mathematics	DRP1122 Workshop Technology	DRP1433 Computer Programming	DRP2112 Jigs & Fixture	DRP2223 Mechanics of Material		
	UHL2442 Essential English	DRP1223 Statics	DRP1133 Industrial Management	DRP2113 Manufacturing Processes	DRP2323 Hydraulics & Pneumatics		
		UHS1022 Soft-skills	UHC1012 Falsafah dan Isu Semasa	DRP2122 CAM & CNC Technology	DRP2724 Final Year Project		
		DUM1123 Calculus	DUM2113 Technical Mathematics	DRP2532 Electronics Principles			
		UHL2412 English for Academic Communication	UHL2432 English for Professional Communication	DRP2132 Quality Control	UGE1002 Entrepreneurship		
				UGE1002 Entrepreneurship			
	TOTAL CREDIT PER SEMESTER	10	18	18	18	16	12
	92	<b>OVERALL TOTAL CREDIT FOR GRADUATION</b>					

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	Knowledge – Graduates shall possess essential engineering / engineering technology knowledge that allows them to be confident in developing value-added solutions for the industry.
PEO2	Competent – Graduates shall demonstrate competence through the promotion to positions of increasing responsibility. In addition, graduates shall participate in continuous professional development and/or training courses or pursuing professional credentials.
PEO3	Leadership – Graduates shall succeed in their professional careers and ethically carry out leading roles in their organization and community.

PROGRAMME LEARNING OUTCOMES (PLO)	
PLO1	Engineering Knowledge - Apply knowledge of mathematics, natural science, engineering fundamentals and an engineering specialisation to wide practical procedures and practices.
PLO2	Problem Analysis - Identify and analyse well-defined engineering problems reaching substantiated conclusions using codified methods of analysis specific to their field of activity.
PLO3	Design/Development of Solutions - Design solutions for well-defined technical problems and assist with the design of systems, components or processes to meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
PLO4	Investigation - Conduct investigations of well-defined problems; locate and search relevant codes and catalogues, conduct standard tests and measurements.
PLO5	Modern Tool Usage - Apply appropriate techniques, resources, and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations.
PLO6	The Engineer and Society - Demonstrate knowledge of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well defined engineering problems.
PLO7	Environment and Sustainability - Understand and evaluate the sustainability and impact of engineering technician work in the solution of well- defined engineering problems in societal and environmental contexts.
PLO8	Ethics - Understand and commit to professional ethics and responsibilities and norms of technician practice.
PLO9	Individual and Teamwork - Function effectively as an individual, and as a member in diverse technical teams.
PLO10	Communication - Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions.
PLO11	Project Management and Finance - Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environments.
PLO12	Lifelong Learning - Recognize the need for and have the ability to engage in independent updating in the context of specialised technical knowledge.

## **COURSE SYNOPSIS FOR DIPLOMA IN MANUFACTURING ENGINEERING TECHNOLOGY**

### **DRP1223**

#### **Statics**

**Credit Hour: 3**

#### Synopsis:

This course introduces the force vector algebra, equilibrium of forces on particles, equilibrium of forces on single rigid body and simple force analysis on simple frames and machine structures (multi-rigid bodies) and problems involving dry friction.

### **DRP1123**

#### **Materials Science**

**Credit Hour: 3**

#### Synopsis:

This course introduces the different materials used in engineering applications and their respective characteristics and properties. This knowledge is quite necessary for a person working in the manufacturing field to select proper material for engineering applications and selection of appropriate manufacturing process for the material selected.

### **DRP1423**

#### **Computer Aided Design & Drafting**

**Credit Hour: 3**

#### Synopsis:

The course presents the integration of Computer Aided Design and Drafting systems. By combining multiple methods for construction of the 2D drafting, creation of 3D solid / surface design model and 3D assembly, students should be able to prepare detailed documentation of engineering drawing and bill of material (BOM) according to industrial standards. Emphasizes will also be given on proper dimensioning techniques, identifying critical dimensions and tolerances for

assembly parts and Geometric Dimensioning and Tolerancing (GD&T).

### **DRP1122**

#### **Workshop Technology**

**Credit Hour: 2**

#### Synopsis

The subject aims at imparting knowledge and skill components in the field of basic workshop technology. It deals with different hand and machine tools required for manufacturing simple metal components and articles.

### **DRP1522**

#### **Electrical Principles**

**Credit Hour: 2**

#### Synopsis

This module will introduce students to basic science of electricity, introduction to instrumentation and measurement, work and energy theorem, basic electrical circuits and introduction to magnetism.

### **DRP1333**

#### **Thermodynamic**

**Credit Hour: 3**

#### Synopsis

This course is designed to give the student the ability to analyze many practical problems in which fluid is the working medium. Basics of Thermodynamics and heat transfer in its three different modes; conduction, convection and radiation, are also introduced. This is to enable the student to analyze simple thermal systems and cycles.

### **DRP1433**

#### **Computer Programming**

**Credit Hour: 3**

#### Synopsis

This course introduces the basics of the C Programming language. The contents of this course includes coding input and output, variables, constants, arithmetic operations, mathematical functions, user defined functions, loops, selection making decision and repetitive construct, array, and also data structure

**DRP1133**  
**Industrial Management**  
**Credit Hour: 3**

Synopsis

This course focuses on basic knowledge of material management in industry. The covered topics are based on production planning and control including forecasting techniques, deterministic inventory planning and control, stochastic inventory planning and control, aggregate production planning, and master production scheduling.

**DRP2132**  
**Quality Control**  
**Credit Hour: 2**

Synopsis

This course introduces fundamental concepts and principles of quality and continuous improvement in manufacturing and service industries, developed by the various quality gurus (Deming, Juran, Feigenbaum, Ishikawa etc.). The use of control charts and statistical tools to determine stability and capability of processes to produce quality products. Defining and quantifying the various forms of quality costs.

**DRP2532**  
**Electronics Principles**  
**Credit Hour: 2**

Synopsis

This course introduces the basic semiconductor devices which are diodes, bipolar junction transistors (BJT), and operational amplifiers. It also presents BJT transistors operational characteristics that cover the DC and AC analysis. Lastly, students will learn how to analyse different types of operational amplifier circuits.

**DRP2213**  
**Dynamics**  
**Credit Hour: 3**

Synopsis

This course intends to apply the knowledge of basic principles of engineering dynamics including kinetics and kinematics motion of a point in both one and two dimensions, velocity in 1D and 2D and break down into components, methods of energy and momentum, Newton's laws of motion, vectors components and magnitudes as well as rigid body motion.

**DRP2612**  
**Metrology**  
**Credit Hour: 2**

Synopsis

This course covers precision dimensional measurement techniques including laboratory experience with optical, electronic, and mechanical comparators, light wave measuring devices, use of precision gage blocks, and surface finish analysis.

**DRP2112**  
**Jigs & Fixture**  
**Credit Hour: 2**

This course covers the importance of jigs and fixtures in industrial application. Several jigs and fixture types are introduced where emphasis is given to the function of locating, supporting and clamping, before the design of efficient and ergonomic jigs and fixtures is developed to improve productivity.

**DRP2113**  
**Manufacturing Processes**  
**Credit Hour: 3**

Synopsis

This course introduces various challenges and issues in modern manufacturing process and operations, ranging from traditional topics such as casting, forming, machining and joining process

**DRP2623**  
**Industrial Automation & Robotics**  
**Credit Hour: 3**

Synopsis

In this course, students will be exposed to automation and machinery concepts and terminology as used in the industry. The fundamental knowledge learned during the previous years will be combined and applied to the context of automation and machinery. The students will be tested for their understanding of the concepts and terminologies, and will be required to develop, document, and present an industrial automation solution for a test case manufacturing system.

**DRP2122**  
**CAM & CNC Technology**  
**Credit Hour: 2**

Synopsis

This course introduces students to CAM principle, application, and integration that applied in the modern manufacturing system. The CAM section includes the determination of optimized 2-axis and 3-axis milling tool path strategies and parameters using computer-assisted simulation software with a sound knowledge of concern in machining accuracy, cost and efficiency, NC code generation /editing, transferring of NC code to the CNC machine and running of the program. The CNC technology section

consists of the various types of CNC machine construction, feed drives, axis system and automatic tool changer. In addition, manual programming fundamentals both for milling and turning operation will also be emphasized.

**DRP2123**  
**Manufacturing System**  
**Credit Hour: 3**  
**Prerequisite:**

Synopsis

This course provides in-depth understanding of manufacturing system components, Manufacturing Operations, Models and Metrics useful to evaluate them, Material Transport and storage systems, analysis of Single cell, Cellular Manufacturing and Flexible Manufacturing systems. Deals with the analysis of manual and automated assembly systems.

**DRP2223**  
**Mechanics of Material**  
**Credit Hour: 3**

Synopsis

This course intends to provide mechanics of deformable bodies with emphasis on principles of stress and strain, shear and bending moment, torsion, buckling, failure criteria and design concepts.

**DRP2323**  
**Hydraulics & Pneumatics**  
**Credit Hour: 3**

Synopsis

This course consists of fundamentals of fluid mechanics and fluid power systems. Fundamentals of fluid mechanics including properties of fluid, fluid in static and fluid in motion. Fluid power system including fluid power principles, devices, materials, hydraulic and pneumatic systems with emphasis on pumps, compressors, motors, and actuators.

**DRP2724**  
**Final Year Project**  
**Credit Hour: 4**

Synopsis

This course involves a technical project related to the nature of engineering technology. Students are required to design and develop appropriate equipment/system. In the later stage, the project involves fabrication, testing and analyzing the system/equipment. The deliverable of the outcome is carried out through presentation and technical report.

**DRP3910**  
**Industrial Training**  
**Credit Hour: 10**

Synopsis

In Industrial Training the students should gain insight into industrial practice, in order to visualize the tasks and possibilities of their later occupation work. All students are required to undergo industrial training for a certain period that has been agreed by the faculty during the last semester of the academic year. The performance of each student during the periods of his/her industrial training is evaluated by the faculty staff, and the representatives from employer organizations.





# FACULTY OF INDUSTRIAL MANAGEMENT

COURSE INFORMATION 2022-2023



## CURRICULUM STRUCTURE BACHELOR OF BUSINESS ANALYTICS WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
CORE COURSES	BPC1113 Principles of Management	BUM2413 Applied Statistics	BPQ2233 Project Management	BPQ2123 Organization Behaviour	BPC3113 Research Methodology	BPC3132 Final Year Project 1	BPC3123 Strategic Management	BPC4112 Industrial Training
	BSD1313 Introduction to Data Science	BPC1123 Principles of Economics	BPQ1223 Principles of Operation Management	BPQ2223 Supply Chain & Logistics Management	BPD3113 Business Communication	BPQ2213 Financial Management	BPC4114 Final Year Project 2	
	BSD1123 Linear Algebra	BPC1133 Principles of Marketing	BPD2242 Big Data: Cases & Applications	BSD1323 Storytelling and Data Visualization	BPE4523 Computer Modelling & Simulation	BPM3323 Project Risk Management	BPD4113 Data Ethics & Governance	
	BUM1223 Calculus		BSD2213 Data Science Programming I	BSD2223 Data Science Programming II	BSD3523 Machine Learning	Elective 2 (Business / Manufacturing)	Elective 4 (Business / Manufacturing)	
			BPE4212 Database System	BSD3143 Operational Research	BSD3533 Data Mining	Elective 3 (Business / Manufacturing)		
106	12	9	13	15	18	14	13	12
<b>University Courses:</b>								
18	Falsafah dan Isu Semasa, Fundamentals of English Language, Technopreneurship, Co-Curriculum, Penghayatan Etika dan Peradaban, English for Academic Communication, Foreign Languages Level 1, Soft Skills, English for Technical Communication, Foreign Languages Level 2, English for Professional Communication							
124	<b>OVERALL TOTAL CREDIT FOR GRADUATION</b>							

### ELECTIVE COURSES FOR BACHELOR OF BUSINESS ANALYTICS WITH HONOURS

ELECTIVES	CODE	COURSE	CREDIT HOUR
<b>BUSINESS</b>	BPE4913	Customer Analytics	3
	BPE4923	Social Media Analytics	3
	BPE4933	Human Resources Analytics	3
	BPE4943	Financial Modelling & Analytics	3
	BPE4953	Business Forecasting	3
<b>MANUFACTURING</b>	BPE4963	Smart Factory and Logistics	3
	BPE4973	Predictive Maintenance	3
	BPE4983	Cyber-Physical Systems	3
	BPE4993	Smart Manufacturing	3
	BPE3523	ERP Systems	3

#### PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1	Be equipped with business operation knowledge and analytical capabilities to contribute towards sustainable solutions for better data driven decision making.
PEO2	Build and enhance technical fluency in analytics by adapting to growing technologies and software solutions.
PEO3	Be ethically responsible with high level of data integrity and concern for society and environment.

#### PROGRAMME OUTCOMES (PO)

PO1	The ability to apply knowledge of concepts, theories and principles that underpin both business operation knowledge and analytical capabilities.
PO2	The ability to demonstrate practical and analytical skills.
PO3	The ability to identify potential problems, formulates alternatives, and proposes the best solution.
PO4	The ability to express complex and sophisticated ideas fluently to comprehend issues within technical and commercial aspects.
PO5	The ability to function effectively as an individual and in teams.
PO6	The ability to recognise the need to undertake life-long learning, and acquiring the capacity to do so.
PO7	The ability to adopt entrepreneurial mind set and innovative thinking.
PO8	The ability to appreciate professional and ethical values in dealing with data issues globally and locally.
PO9	The ability to acquire leadership skills in coordinating relevant tasks and programs.

## COURSE SYNOPSIS

### COURSE STRUCTURE FOR BACHELOR OF BUSINESS ANALYTICS WITH HONOURS

#### CORE FACULTY COURSES

BPC1113

Principles of Management

Credit: 3

Prerequisite: None

#### Synopsis

This course serves as an introduction to the discipline of management. It is designed to integrate the accepted theories in the area with real world applications with the basic knowledge and skills needed for managing others. The contemporary issues and global challenges along with traditional management functions shall be discussed.

#### Course Outcomes

- CO 1 Demonstrate the Principles of Management in solving various issues and global challenges.
- CO 2 Display good practices of management functions in managing event.
- CO 3 Compare various management styles of contemporary approaches in current setting.

BSD1313

Introduction to Data Science

Credit: 3

Prerequisite: None

#### Synopsis

Data science is an emerging field of study and requires a powerful combination of various disciplines namely mathematics, statistics, computer science and domain expertise. This course presents the overview of data science including the definition and foundation of data science, the process of data science, its infrastructure, computing for data science and issues related to data science. Case studies are discussed to illustrate the data science application.

#### Course Outcomes

- CO 1 Explain the terminologies used in data science.
- CO 2 Distinguish the components and requirements of data science.
- CO 3 Communicate effectively in written and oral forms by completing the task given.

BSD1123

Linear Algebra

Credit: 3

Prerequisite: None

#### Synopsis

This course covers fundamentals of matrix theory followed by some applications. The first part of this course covers introduction to vectors, solving linear equations, vector spaces and subspaces, orthogonality, determinants, eigenvalues and eigenvectors, linear transformations, complex vectors and matrices. The second part are the applications which cover applications of linear algebra in data science.

#### Course Outcomes

- CO 1 Acquire fundamental principle of linear algebra.
- CO 2 Analyze mathematical problems using linear algebra knowledge.
- CO 3 Provide solution to linear algebra problems arise into real life data.

BUM1223

Calculus

Credit: 3

Prerequisite: None

#### Synopsis

This course discusses in depth of functions and differentiation. Topics cover under this course are: The Concepts of Limit, Computation of Limit, Continuity and Its Consequence, Limit Involving Infinity, The Derivative, Computation of Derivative, The Product and Quotient Rule, The Chain Rule, Higher Derivatives, Implicit Differentiation, Rates of Change and Related Rates, Maximum and Minimum Values, Mean Value Theorem, Concavity

and Second Derivatives Test, Overview of Curve Sketching, Optimization Problems, Antiderivatives, Indefinite Integral, Definite Integral, Integration by Substitution, Integration by Parts, Integration of Rational Function using Partial Fractions, Area Between Curves. Arc Length and Surface Area, Volume: Slicing Method, Volume: Disks Method, Volume by Cylindrical Shells.

#### Course Outcomes

- CO 1 Acquire fundamental principle of differentiation.
- CO 2 Apply appropriate calculus concepts to solve various technological problems.
- CO 3 Use appropriate software and tool to solve the graphical and computational problems in calculus.

BUM2413

Applied Statistics

Credit: 3

Prerequisite: None

#### Synopsis

This course is primarily focuses on the statistical data analysis knowldege in various types of everyday life data. This course aims to expose students to the practical knowledge of statistical methods in any area of interest. Students are exposed to statistical problem-solving methodology and descriptive statistics; confidence interval; hypothesis testing; analysis of variance (ANOVA); regression and correlation including simple and multiple linear regressions; goodness-of-fit test and contingency tables. Appropriate software such as Microsoft Excel shall be used in this course.

#### Course Outcomes

- CO 1 Acquire fundamental principle of statistics.
- CO 2 Perform statistical analysis by using appropriate statistical theory and methodology.
- CO 3 Analyse real life data to solve related problems in various

disciplines.

BPC1123

Principles of Economics

Credit: 3

Prerequisite: None

#### Synopsis

This course is designed to introduce students to key concepts used in microeconomics and macroeconomics, and to facilitate a basic understanding of economic phenomena. The goals will help students to understand fundamental concepts and tools so that students can use them to analyse various economic issues at the national and international levels. This course is primarily concerned with Malaysian economy and will help them understand how economy works.

#### Course Outcomes

- CO 1 Explain the basic Macro & Micro economic concepts.
- CO 2 Examine the usage of economics concepts for business phenomena.
- CO 3 Demonstrate the usage of the economic models for decision making.

BPC1133

Principles of Marketing

Credit: 3

Prerequisite: None

#### Synopsis

This course serves as an introduction to the discipline of management. It is designed to integrate the accepted theories in the area with real world applications to provide students with the basic knowledge and skills needed for managing others. This course is designed to provide students with an understanding of marketing mix components; explain the environmental factors which influence consumer and organizational decision-making processes; outline a marketing plan; and how marketing works in today's marketing environment.

#### Course Outcomes

- CO 1 Demonstrate the Principles of Marketing in solving various issues.
- CO 2 Reproduce a comprehensive marketing plan and apply course concepts to real or imaginary products.
- CO 3 Deliver persuasive presentation on marketing programs.

BPQ2233  
Project Management  
Credit: 3  
Prerequisite: None

#### Synopsis

This course provides foundation and knowledge of project management. Students will be exposed to various body of knowledge and institutions related to project management in particular to Project Management Institute (PMI). Through out semester, students be give the well-round knowledge of theories, project management process and the skills required to manage a project effectively. Last but not least, students also will have opportunity to explore various methods and approaches of project management and project management software.

#### Course Outcomes

- CO 1 Explain concept of project management process according to selected body of knowledge and organizational influence towards project management success.
- CO 2 Demonstrate understanding of project life-cycle management according to different industries.
- CO 3 Identify best-fit project management software for the organization.

BPQ1223  
Principles of Operation Management  
Credit: 3  
Prerequisite: None

#### Synopsis

The course provides a range of academic knowledge, operations understanding, operational management techniques. It will

focus on the main decision areas of operations management and their impact on business functions and the role of the operations manager and the relationship with productivity improvement.

#### Course Outcomes

- CO 1 Demonstrate the fundamental concept and the main areas of operation management.
- CO 2 Apply operation decisions in solving operational problems.
- CO 3 Justify operations management requirements.

BPD2242  
Big Data: Cases & Applications  
Credit: 2  
Prerequisite: None

#### Synopsis

This course provides coverage of various cases and applications of big data.

#### Course Outcomes

- CO 1 Understand the theory and concept of big data.
- CO 2 Analyze big data cases and applications.
- CO 3 Demonstrate big data issues in various issues and applications.

BSD2213  
Data Science Programming I  
Credit: 3  
Prerequisite: None

#### Synopsis

Programming skill is vital to solve practical problems in various disciplines such as in science, engineering, technology and industries. This course introduces programming concepts and language construction using Python software. Students will learn about variable, loop and branching, functions, solving equations using sympy, numerical computation using numpy, graph visualization using matplotlib and data preparation using pandas. Case studies in selected disciplines are presented to provide a motivating experience to student. At the end of this

course, students will be able to develop a friendly graphical-user interface using Python programming.

#### Course Outcomes

- CO 1 Acquire fundamental knowledge on basic functions of programming language.
- CO 2 Construct programming codes using import libraries.
- CO 3 Develop programming codes to solve problems.
- CO 4 Work collaboratively to solve assigned task.
- CO 5 Demonstrate innovative ideas in developing a graphical user interface.

#### BPE4212

Database System

Credit: 2

Prerequisite: None

#### Synopsis

This course covers fundamentals of database architecture, database management systems, and database systems. Students learn how database management systems can support business processes and are made familiar with the fundamental concepts of data mining / data retrieval. They apply the concepts in a realistic enterprise scenario (capstone project).

#### Course Outcomes

- CO 1 Identify user needs and process requirements from an enterprise data model.
- CO 2 Manipulate modern data query languages.
- CO 3 Integrate basic data mining tools for example business scenarios.

#### BPC2123

Organization Behaviour

Credit: 3

Prerequisite: None

#### Synopsis

This course provides an overview of different personnel, work environment and

organizational issues to be investigated in industrial psychology. The major application of psychology at work place is covered. The management of human capital and their issues like selection, training, evaluation, relationship at work place and related aspects are focused.

#### Course Outcomes

- CO 1 Analyze and understand theories of Industrial Psychology and management of human capital.
- CO 2 Demonstrate the issues relating to work behaviour of employees and the human capital management.
- CO 3 Describe human resource skills for effective industrial management.

#### BPQ2223

Supply Chain and Logistics Management

Credit: 3

Prerequisite: None

#### Synopsis

The course covers supply chain and logistics management in business environment which includes concepts of SCM, logistics, sourcing strategy, supply chain risk, purchasing, distribution, transportation, facilities location, demand forecasting, inventory, pricing strategy and information technology used in industrial system and operation management.

#### Course Outcomes

- CO 1 Illustrate the roles of supply chain and logistics management in the industry.
- CO 2 Explain supply chain and logistics management methods and concepts in solving related industrial operation and system problems.
- CO 3 Present operation information and data from various records and database utilized for industrial supply chain and logistics management application.

#### BSD1323

Storytelling and Data Visualization

Credit: 3

Prerequisite: None

#### Synopsis

Data visualization is increasingly important and useful to complement data analytics in order to communicate the findings, especially to the non-technical audience. Creating an effective storytelling through the correct data visualization skill is vital in making sure the information presented is clear and easy to understand. In this course, various aspects of data visualization from simple to complex tables, graphs and charts are demonstrated using Microsoft Excel, Tableau or Power BI. By the end of this course, student will be able to generate powerful reports and dashboards that will help people make decisions and take action based on real world data. Students will learn how to create high-impact visualizations of common data analyses to help them see, understand and effectively tell a story about the data.

#### Course Outcomes

- CO 1 Acquire fundamental skill of data visualization.
- CO 2 Demonstrate the data visualization skill using an effective storytelling.
- CO 3 Display a powerful report and dashboard in solving various applications using appropriate software.
- CO 4 Work collaboratively as part of a team to solve given problem through group discussion and presentation.
- CO 5 Demonstrate an active communication through group discussion and presentation.

#### BSD2223

Data Science Programming II

Credit: 3

Prerequisite: None

#### Synopsis

Programming skills is required in data related study. This course presents basic R programming language which are widely used and open-source based. The course discusses fundamental feature of R, data

exploration and data presentation tools. Students will be able to identify appropriate tools to write codes, manipulate, analyse and present their own analysis using R. This is a hands-on project-based course to enable students to develop programming and critical thinking skills. The students should be able to extend these basic knowledge and skills using R for advanced application in data science.

#### Course Outcomes

- CO 1 Acquire fundamental knowledge on basic functions of programming language.
- CO 2 Analyse and summarise data using appropriate programming tools.
- CO 3 Develop programming codes to solve problems.
- CO 4 Demonstrate verbal and written communication skills.
- CO 5 Relate entrepreneur skills in assigned task.

#### BSD3143

Operational Research

Credit: 3

Prerequisite: BSD1123 Linear Algebra

#### Synopsis

Operational research is the fundamental knowledge and skill set which can be used to determine the best solution for real world industrial problems via mathematical modelling. This course aims to expose students to the concept and methods of optimization using data, and the required tools to solve various applications in industry. In this course, students will be trained to use powerful optimization techniques which includes linear programming, simplex method and sensitivity analysis, transportation and assignment model, network models, integer programming and queuing models. This course utilizes both students' personal and technical skills to make the best decision which is applicable in various industry settings i.e. manufacturing, service industry, transportation, marketing, finance, medicine, law, military and public policy, with the assistance of various computer modelling solver of TORA.

#### Course Outcomes

- CO 1 Acquire fundamental principle of operational research.
- CO 2 Provide solution to industrial problems using operational research methods.
- CO 3 Work collaboratively as part of a team to solve given problem through group discussion and presentation.

#### BPC3113

##### Research Methodology

Credit: 3

Prerequisite: None

#### Synopsis

This course is designed to introduce students to the research methods that can be applied when conducting research projects.

#### Course Outcomes

- CO 1 Differentiate between qualitative and quantitative research method.
- CO 2 Construct research proposals by using appropriate research methods.
- CO 3 Propose research methods for problem solving.

#### BPD3113

##### Business Communication

Credit: 3

Prerequisite: None

#### Synopsis

This course provides students with the essential business communication skills for them to function effectively at work. Students will learn how to communicate for career success, with a diverse workforce, through verbal and nonverbal messages, and in a variety of settings such as in meetings and teams. Students will also learn ways to develop their listening, interpersonal, writing and presentation skills.

#### Course Outcomes

- CO 1 Explain principles of effective

business communication.

- CO 2 Construct an outline and deliver a business presentation effectively.

- CO 3 Propose feasible solutions to overcome communication problems.

#### BPE4523

##### Computer Modelling & Simulation

Credit: 3

Prerequisite: None

#### Synopsis

This course demonstrates how to construct a computer representation of a real world system. A developed simulation model can be used to aid decision making by providing information and predicts how the real-world system behaves under a variety of circumstances. Students will develop both discrete event simulation and system dynamics models with the aid of ARENA and iThink simulation software.

#### Course Outcomes

- CO 1 Design logical models to represent real world systems.
- CO 2 Simulate real world systems using simulation software.
- CO 3 Analyze data and output of the simulation model.

#### BSD3523

##### Machine Learning

Credit: 3

Prerequisite: None

#### Synopsis

Machine learning is a subfield of data science that focuses on designing algorithms that can learn from data and make predictions on it. This course provides an introduction to machine learning which includes the basic components of building and applying prediction functions with the emphasis on practical applications. Students will be provided with basic concepts such as training and test sets, overfitting, and error rates. Range of models based and algorithmic machine learning methods are covered including regression, classification



trees, Naive Bayes, random forests and so forth. In addition, the course will cover the complete process of building prediction functions including data collection, feature creation, algorithms, and evaluation. Weka/ Python/ SAS Enterprise Miner/ Knime software shall be used by students to implement these ideas in practice.

#### Course Outcomes

- CO 1 Distinguish the machine learning concepts and methodologies in computer science.
- CO 2 Apply the machine learning models in solving real world problems.
- CO 3 Construct the programming codes or workflows using appropriate machine learning tools.
- CO 4 Develop leadership skill in grouping assessment.
- CO 5 Integrate machine learning knowledges to the project and future problems.

BSD3533

Data Mining

Credit: 3

Prerequisite: None

#### Synopsis

Data mining is the process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems. This course introduces basic concepts, tasks, methods, techniques, model building and testing, and interpreting and validating results in data mining. The predictive analytics methods are applied to various data sets from many different fields. At the end of the lecture, students will create their own programming codes/ predictive workflow models in order to solve real world problems for their project. The students experience the theoretical and practical aspects of data mining knowledge in lecture and laboratory session. Python and RapidMiner/ Knime software is used by students to implement these ideas in practice.

#### Course Outcomes

- CO 1 Acquire the data mining concepts

and methodologies in computer science.

- CO 2 Apply data mining model prototype/module and demonstrate critical thinking ideas in data mining knowledge and problem-solving.
- CO 3 Construct the programming codes or workflows using appropriate analytics tools.
- CO 4 Demonstrate verbal and written communication skills.
- CO 5 Integrate data mining knowledges to the project and future problems.

BPD3212

Final Year Project 1

Credit: 3

Prerequisite: None

#### Synopsis

This course will expose the students on the process of conducting academic research in order to provide the skills and ability in carrying out research project. The outcome of Industrial Case Proposal is a complete research proposal, which covers research background, research problem, research questions, research objectives, scope of study, significance of study, literature review, research framework/model, and research methodology.

#### Course Outcomes

- CO 1 Produce problem statement and research objective in the chosen industrial management field.
- CO 2 Manipulate the reliable sources for exceptional, detail and accurate literature review.
- CO 3 Construct a noble research work by producing the feasible flow of methodology and validated data collection instrument.
- CO 4 Build effective skills in report writing and oral presentation- through overall report contents and oral presentation session.
- CO 5 Demonstrate good attitude to fulfill research requirements.

BPQ2213

Financial Management

Credit: 3  
Prerequisite: None

#### Synopsis

This course is an introductory course and enables students to understand the basic concept of finance in an organization. Students will define concepts, characteristics, features and analyzing related financial statements. The course will equip students with understanding and application of finance which cover on financial strategy, debt and equity management, the key drivers of shareholders value, risk and return concept in investment, and capital budgeting as vehicles to evaluate investment choices.

#### Course Outcomes

- CO 1 Analyze financial management problems by using all concepts in financial management.
- CO 2 Calculate and utilize financial formula to a particular area in financial management.
- CO 3 Explain the key driven in financial management and its importance in an organization.

BPM3323  
Project Risk Management  
Credit: 3  
Prerequisite: None

#### Synopsis

This course develops student with necessary knowledge and practical skills in managing risks in becoming a good project manager. In this course, students will be exposed to risk management process used by an organization during the Project Life Cycle. Students will have a firm understanding on the input, output, as well as tools during risk identification, risk analysis, risk response planning and risk control according to PMBOK (6th Edition).

#### Course Outcomes

- CO 1 Explain key project risks.
- CO 2 Categorize the impacts of risk to a project in order to finalized the best mitigation strategies to be employed.

CO 3 Explain risk management process.

BPC3123  
Strategic Management  
Credit: 3  
Prerequisite: None

#### Synopsis

This course exposes students on the aspects of strategic management in business environment. The covered areas for this course are: the nature of strategic management; external and internal assessment; strategic analysis and choice; strategy implementation; and strategic evaluation and control.

#### Course Outcomes

- CO 1 Analyze the strategic management concepts and techniques.
- CO 2 Identify the strategic management concepts and techniques in business environment.
- CO 3 Formulate strategy choice for implementation.

BPD4124  
Final Year Project 2  
Credit: 3  
Prerequisite: None

#### Synopsis

This course will expose the students on the process of conducting academic research in order to provide the skills and ability in carrying out research project in the area of their study. The covered areas of Final year Project II are: (i) development of research instrument for data collection, (ii) carrying out data collection, (iii) analysing data collected, (iv) interpreting data, (v) writing reports.

#### Course Outcomes

- CO 1 Produce validated research instrument.
- CO 2 Organize the research findings based on theoretical knowledge.
- CO 3 Construct the conclusion of the research and recommendation for improvement.

- CO 4 Build an effective skills in report writing and oral presentation through overall report contents and oral presentation session.
- CO 5 Demonstrate a good attitude to fulfill research requirements.

**BPD4113**

Data Ethics & Governance

Credit: 3

Prerequisite: None

#### Synopsis

The course provides an understanding of good corporate governance, what are the failures of corporate governance especially pertaining to data governance, legal and regulatory framework in Malaysia and the agencies/units responsible for data integrity. It will also give an overview of data integrity, assurance of data, data governance and data governance plan to ensure integrity and governance of data in an organisation.

#### Course Outcomes

- CO 1 Understand the comprehension of theories, concepts and philosophy of ethics and governance.
- CO 2 Explain data ethics and governance issues that are critical in professional and business environment.
- CO 3 Justify the most appropriate course of action and engage in ethical and professional conducts.

**BPC4112**

Industrial Training

Credit: 3

Prerequisite: None

#### Synopsis

As part of the Faculty of Industrial Management with an integrated curriculum of the Bachelor of Business Analytics degree courses, all students are required to undergo industrial training for a minimum period of 24 weeks. Placement of students at various companies will be supervised and coordinated by the Industrial training Committee set up by the faculty. students

will be placed at various companies throughout Malaysia. The training at the various companies will expose the students to a real working environment including the companies' organization structures, business operations and technology management. the hands-on experience in the training will reinforce what has been taught at the University. the students are also required to prepare an industrial training report and do the final presentation describing the tasks they assigned in their placement.

#### Course Outcomes

- CO 1 Expose students to the "real" working environment and get acquainted with the organization structure, business operations and technology management.
- CO 2 Build effective communications skills in written and oral presentation.
- CO 3 Build hands-on experience in their related field so that students can relate to and reinforce what has been taught at the University.
- CO 4 Integrated cooperation and collaboration between industry and the university in promoting a knowledgeable society.

## ELECTIVE COURSES

### BUSINESS

**BPE4913**

Customer Analytics

Credit: 3

Prerequisite: None

#### Synopsis

This course prepares and develops students for data-led, customer-centric, problem-solving roles that help companies to understand their customer to make better business decisions. Topics such as building customer data, predicting customer personas, understanding customer life cycle, growing and retaining customers through analytics will be

discussed.

#### Course Outcomes

- CO 1 Understand the theory and concepts of managing customers as well as the application of customer analytics.
- CO 2 Apply the various analytical approaches in solving customer related issues.
- CO 3 Explain how customer analytics can be effectively used and managed for better business decision.

BPE4923

Social Media Analytics

Credit: 3

Prerequisite: None

#### Synopsis

This course introduces the potential of social media analytics to grow business by captivating the use of social media, analytics and data mining. Through this course, students will learn a wide variety of advanced topics in social media analytics such as Text Analytics, Network Analytics, Action Analytics, Search Engine Analytics, Location Analytics and Apps Analytics.

#### Course Outcomes

- CO 1 Understand the theory and concepts of managing social media.
- CO 2 Apply the various analytical approaches to capture the value of social media.
- CO 3 Explain how social media analytics can be effectively used and managed for better business decision.

BPE4933

Human Resource Analytics

Credit: 3

Prerequisite: None

#### Synopsis

This course introduces the student to the theory, concepts and business application of human resources. On top of that this course also discusses on how analytics tools / techniques can be used to solve

issues related to human resources. Through this course, students will learn on gathering, analysing and interpreting relevant human resources metrics to make better decisions about managing people in organizations.

#### Course Outcomes

- CO 1 Understand the theory, concepts and business application of human resources management.
- CO 2 Apply the various analytical approaches used by HR professional in solving any issues related to human resources management.
- CO 3 Explain how relevant human resources metrics in company can effectively managed.

BPE4943

Financial Modelling & Analytics

Credit: 3

Prerequisite: None

#### Synopsis

This course introduces a set of modern modelling and analytical tools to solve practical problems in finance. The goal is to bridge the gap between finance theories and practice by building operational models, taking them to the data, and using them to aid financial decision making. The topics include: (1) Corporate Finance – Cost of Capital & Financial Statement; (2) Time Series Analysis in Finance; (3) Investments; (4) Value at Risk; (5) Options Pricing; and (6) Bond Portfolio Management.

#### Course Outcomes

- CO 1 Identify suitable analytical tools for financial performance analysis and forecasting.
- CO 2 Analyse financial statements of corporate firms and evaluate firm performance.
- CO 3 Identify computer-based models using corporate financial statements and forecast their performance.

**BPE4953**  
**Business Forecasting**  
 Credit: 3  
 Prerequisite: None

**Synopsis**  
 This course covers topics in time series analysis and other statistical techniques on forecasting. The objective of this course is to equip students with various forecasting techniques and knowledge on modern statistical methods for analyzing time series data. The course consists of three parts: I. Univariate methods; II. Regression methods; III. ARIMA models.

**Course Outcomes**  
 CO 1 Understand fundamental principle of forecasting.  
 CO 2 Analyze real life data to forecast business problems.  
 CO 3 Perform forecasting models by using appropriate tools and methods.

## **MANUFACTURING**

**BPE4963**  
**Smart Factory & Logistic**  
 Credit: 3  
 Prerequisite: None

**Synopsis**  
 The course is intended to introduce the role of smart warehouse and logistic with the use of Internet of Things (IoT). This course also provide insight on warehouse operation and industrial logistic including storage and handling, warehouse layout, warehouse performance, warehouse integration, international logistic, inventory management, and transportation planning.

**Course Outcomes**  
 CO 1 Describe the role of smart warehousing and logistic.  
 CO 2 Explain strategic framework for logistics decisions which involves planning, designing and operating processes.  
 CO 3 Demonstrate analytical knowledge in problem solving situation of smart warehouse and logistics

management.

**BPE4973**  
**Predictive Maintenance**  
 Credit: 3  
 Prerequisite: None

**Synopsis**  
 The aim of this course is to provide students with the knowledge and skills of predictive maintenance and train them to apply their knowledge to ensure machines to be productive and have longer life. This course provides a range of academic knowledge, understanding of maintenance planning, predictive maintenance techniques and seeks to develop within students the ability to integrate these with an appropriate software. On completion of the course, students will have the core knowledge needed to do inspection and monitoring, to analyse the conditions that cause a failure to the machine and to develop a predictive maintenance plan to tackle the problem of high down time in the firms.

**Course Outcomes**  
 CO 1 Analyse the core concepts of predictive maintenance in industrial organization.  
 CO 2 Construct a predictive maintenance program to predict and prevent equipment failure that reduce lost of production and increase overall profit.  
 CO 3 Demonstrate an understanding of the different techniques of predictive maintenance to critically evaluate the failure mode and effect of an equipment or a system.

**BPE4983**  
**Cyber Physical System**  
 Credit: 3  
 Prerequisite: None

**Synopsis**  
 This course introduces students on techniques of integrations of and interaction between computation and

physical processes. It integrates the dynamics of the physical processes with those of the communications, computation and networking, and analysis techniques for the integrated systems. Emerging applications of CPS will be studied, including mobile computing, mobile social networks, smart grid, transportation, and cloud of things. Course projects on design and simulation for CPS systems consolidate students' understanding, and further strengthen their practical problem-solving and programming skills.

#### Course Outcomes

- CO 1 Analyse the core concepts of cyber physical system in digital industrial organization.
- CO 2 Organize the interaction between perception, communication, learning, behaviour generation and reasoning capabilities of intelligent and autonomous systems with human decision makers.
- CO 3 Explain the capabilities and security of the cyber-physical systems models.

**BPE4993**  
Smart Manufacturing  
Credit: 3  
Prerequisite: None

#### Synopsis

This course introduces students on the basic of manufacturing systems and power of digital manufacturing and design technologies, particularly how product data can seamlessly transfer through the entire lifecycle of a manufactured product. All hands-on modelling and virtual manufacturing simulations will be done on selected manufacturing software, an example of a cloud based design and for the Industrial Internet of Things. Students will also be introduced to how machines communicate manufacturing data from its control systems to machines around the shop floor factory or to enterprise level servers.

#### Course Outcomes

- CO 1 Analyse the implementation of

automated manufacturing systems and their components.

- CO 2 Design a components for handling technology, industrial robotics, sensors, and controls using 3D printing to understand smart manufacturing and its implimenation in different industries.
- CO 3 Demonstrate an understanding of NC, CNC, Part programming, simulation modeling and control system of manufacturing processes and facilities.

**BPE3523**  
ERP System  
Credit: 3  
Prerequisite: None

#### Synopsis

The aim of the course is to teach the basics about modern integrated information systems and how they are deployed in companies. A special emphasis is placed on understanding the connections between business process management and supporting business processes through integrated information systems.

#### Course Outcomes

- CO 1 Understand theoretical foundations of modern ERP systems and their application in a company environment.
- CO 2 Describe the connection between business process management and modern ERP systems.
- CO 3 Demonstrate ERP systems in real-life situations to solve specific process tasks (e.g. order processing, production planning, invoicing, etc.

## CURRICULUM STRUCTURE BACHELOR OF BUSINESS ENGINEERING WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
COURSES	BPN1013 Principles of Management	BPN1062 Fundamentals of Project Management	BPN2123 Corporate Finance & Investment	BPN2076 Individual Field Project – Business & Engineering	BPN3023 Operations Research	BPN3012 Industrial Training	BPE41*2 / BPE43*2 Elective (Business) IV	BPN4013 Individual Study Project (ISP)
	BPN1022 Business Law	BPN1072 Accounting II - Cost Accounting	BPN2053 ERP Systems & Business Process Management	BPN2092 CSR Project	BPN2113 Supply Chain Management	BPE41*3 / BPE43*3 Elective (Business) V	BPN4026 Thesis	
	BPN1032 Accounting I - Financial Accounting	BPN1083 Engineering Mechanics	BPN2032 Fundamentals of Marketing	BPN2103 Cross Module Seminar I	BPE42*3 / BPE44*3 Elective (Engineering) I	BPE41*3 / BPE43*3 Elective (Business) VI	BPN4033 Cross Module Seminar II	
	BPN1043 Introduction to Computer Science	BPN1093 Technical Design / CAD	BUM2413 Applied Statistics	BPN2023 Industrial Engineering	BPE41*3 / BPE43*3 Elective (Business) II	BPE42*3 / BPE44*3 Elective (Engineering) II		
	BUM1113 Technical Mathematics	BUM1223 Calculus	BPE41*3 / BPE43*3 Elective (Business) I	BPN2043 Fundamentals of Electrical Engineering	BPE41*3 / BPE43*3 Elective (Business) III	BPE42*3 / BPE44*3 Elective (Engineering) III		
	UHG1002 Deutsche I	UHG1012 Deutsche II	UGE2002 Technopreneurship	BPN2013 Quality Management	UHE3212 Global Competencies	BPE42*2 / BPE44*2 Elective (Engineering) IV		
	UHC1012 Falsafah dan Isu Semasa	UHC2022 / UHE3082* Penghayatan Etika dan Peradaban / Malaysian Study*	UHG2002 Deutsche III	UHG2002 Deutsche IV				
	UHS1021 Soft Skills 1		UQA2**1 CoQ – II					
	UQA1**1 CoQ – I							
TOTAL CREDIT PER SEMESTER	20	18	19	21	17	12	16	12
OVERALL TOTAL CREDIT FOR GRADUATION	135							

**ELECTIVE COURSES FOR  
BACHELOR OF BUSINESS ENGINEERING WITH HONOURS**

ELECTIVES	CODE	COURSE	CREDIT HOUR
<b>Elective I, II, IV, V (Business)</b>	BPE4123	Supply Chain Control & Management Control Systems	3
	BPE4133	Advanced Project Management & Control	3
	BPE4143	Lean Management	3
	BPE4153	Simulation Game	3
	BPE4163	Technical Planning Case	3
	BPE4313	Production Accounting & Control	3
<b>Elective III (Business)</b>	BPE4112	Innovation & Technology Management	2
	BPE4122	HR Management	2
	BPE4132	International Business Environment	2
<b>Elective I, II (Engineering)</b>	BPE4213	Intra-Logistics	3
	BPE4223	Distribution Logistics	3
	BPE4233	International Transport Logistics	3
	BPE4243	Warehouse & Inventory Planning	3
	BPE4413	Production Planning & Methods	3
	BPE4423	Technical Applications & Machines	3
	BPE4433	Materials Science	3
	BPE4443	Product Engineering	3
<b>Elective III (Engineering)</b>	BPE4453	Electrical Drives	3
	BPE4212	Database Systems	2
	BPE4222	Sustainability/Energy Efficiency	2
	BPE4232	Power Management (Electrical Grids)	2
<b>Total Credit</b>			<b>28</b>

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Integration: Integrating business engineering knowledge and skills in innovating organisational practices.
PEO2	Leadership: To produce leaders in the field of business engineering.
PEO3	Professional Values: Apply high values of professionalism, ethics of responsibility and concern for the environment and society.

**PROGRAMME OUTCOMES (PO)**

PO1	The ability to acquire and analyze knowledge in business engineering discipline.
PO2	The ability to demonstrate practical and technical skills in business engineering domain.
PO3	The ability to identify potential problems, formulate alternatives, and propose the best solution from business engineering perspective.
PO4	The ability to express complex and sophisticated ideas fluently to comprehend issues within technical and commercial aspects.



PO5	The ability to function effectively as an individual and in teams.
PO6	The ability to recognize the need to undertake life-long learning and acquiring the capacity to do so.
PO7	The ability to adopt entrepreneurial mind set and innovative thinking.
PO8	The ability to appreciate professional and ethical values in dealing with business, cultural, and environmental issues globally and locally.
PO9	The ability to acquire leadership skills in coordinating relevant tasks and programs.

**COURSE SYNOPSIS****COURSE STRUCTURE FOR BACHELOR OF BUSINESS ENGINEERING WITH HONOURS****CORE PROGRAMME**

BPN1013

Principles of Management

Credit: 3

Prerequisites : None

**Synopsis:**

This course serves as an introduction to the discipline of management. It is designed to integrate the accepted theories in the area with real world applications with the basic knowledge and skills needed for managing others. The contemporary issues and global challenges along with traditional management functions shall be discussed.

**Course Outcomes:**

- CO 1 Apply the Principles of Management in solving various issues and global challenges
- CO 2 Explain good practices of management functions in managing event
- CO 3 Compare various management styles of contemporary approaches in current setting

BPN1022

Business Law

Credit: 2

Prerequisites : None

**Synopsis:**

This subject introduces the fundamental legal knowledge in relation to business by focusing on the relevant legal theories for commercial activities, the principles of these theories and the application of these legal principles within Malaysian legal framework and global business environment. Students will be introduced to the concept of law, legal system and legal liabilities in commercial contracts, commercial crime, tort, company formation and intellectual property. Upon completing the course, students will have the understanding

on the mechanics of law and its significance to business.

**Course Outcomes:**

- CO 1 Define the theories and basic principles in business law
- CO 2 Describe the existing legal cases related to business activities
- CO 3 Apply the theories and relevant case laws to the facts of described situations or problems

BPN1032

Accounting I:

Financial Accounting

Credit: 2

Prerequisites : None

**Synopsis:**

To introduce students to the concepts and terminology of accounting and financial reporting for modern business enterprises. They will also learn to use accounting information to make conclusions about business activities and to communicate these conclusions to others, basic accounting concepts, how accounting information reflects basic activities of businesses and organizations and how accounting information is used to make decisions about these entities.

**Course Outcomes:**

- CO 1 Apply the fundamental knowledge of financial framework, concepts, principles, and procedures that govern how the financial statements are prepared
- CO 2 Acquired the ability to prepare and analyse financial statements, as well as to solve accounting related problems

BPN1043

Introduction to Computer Science

Credit: 3

Prerequisites : None

**Synopsis:**

The class familiarizes students with basic

principles of computer science as needed in a logistics work environment. After successful completion of this course the students should have gained the following knowledge and developed the following competencies: Basic Programming in Java, Software Development Process, Requirements Engineering and an understanding of the Internet of Things and Services.

#### Course Outcomes:

- CO 1 Have the ability to identify software development needs in a business environment and structure the development process accordingly
- CO 2 Gain an initial understanding of the Internet of Things and Services and how this effects software development and established business processes
- CO 3 Understand the typical structure and components of software programs

BUM1113  
 Technical Mathematics  
 Credit: 3  
 Prerequisites : None

#### Synopsis:

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focusing on providing a basic theoretical foundation for further work. Students are exposed to basic counting; discrete probability; numerical, precision, accuracy and errors; graph; tress and modelling computations. This course integrates symbolic tools, graphical concepts, and numerical calculations.

#### Course Outcomes:

- CO1 Acquire fundamental principle of discrete structure
- CO2 Analyze mathematical problems using discrete structure knowledge
- CO3 Provide solution to discrete structure problems arise in computer science and engineering fields

BPN1062  
 Fundamentals of Project Management  
 Credit: 2

Prerequisites : None

#### Synopsis:

This course provides foundation and conceptual framework of project management. Students will be expose to all body of knowledge in particular with Project Management Institute (PMI). Throughout the semester, students will have the opportunity to discuss various topics, project integration, project initiation, organizational influence on project performance, project manager's role, project management context and project management process groups. Last but not least, students also will have opportunity to explore various methods and approaches of project documentation and project management software.

#### Course Outcomes:

- CO 1 Describe core concept of all knowledge areas of project management
- CO 2 Develop project charter and proper project documentation with project management tools and techniques
- CO 3 Manage a project through each stage of the project management life cycle

BPN1072  
 Accounting II:  
 Cost Accounting  
 Credit: 2  
 Prerequisites : None

#### Synopsis:

This course covers area of study of accounting information as a management decision tool. Topics include production costs, activity-based costing, job costing, budgets, standard costs and variances. The course focuses on the manufacturing environment, but there is some coverage of merchandising and service sectors.

#### Course Outcomes:

- CO 1 Ability to apply the concept of the various costing systems
- CO 2 Acquired the ability to analyse accounting information and making economic decisions

BPN1083  
Engineering Mechanics  
Credit: 3  
Prerequisites : None

Synopsis:

This course introduces introduction to mechanics, force vector, equilibrium of particle, force system resultants, equilibrium of rigid body, structural analysis, friction, centroids and center of gravity.

Course Outcomes:

- CO 1 Apply Newton's Law of motion to force systems
- CO 2 Solve vector operation and resultant system problems
- CO 3 Evaluate the equilibrium of particle and rigid body problem using the equilibrium equation and its free body diagram concept
- CO 4 Calculate the resultant forces, moment with multiple forces in structural problems, centroids and moment of inertia of objects. Analyze the effect of friction of rigid bodies in equilibrium situations

BPN1093  
Technical Design / CAD  
Credit: 3  
Prerequisites : None

Synopsis:

The subject is intended to provide students with introduction and theoretical understanding of computer-aided technologies used in design (CAD) and manufacturing. Students are exposed to various problem-solving techniques as well as hands-on experience and project-based approach in the aspects of industrial product design and development.

Course Outcomes:

- CO 1 Analyze the function of technical drawing using CAD application
- CO 2 Construct geometric using basic construction techniques to create

- objects in CAD
- CO 3 Demonstrate all 3-dimensional object with the proper utilization of views in CAD

BUM1223  
Calculus  
Credit: 3  
Prerequisites : None

Synopsis:

This subject discusses Differentiation and applications, techniques of integration and applications, numerical integration and Taylor polynomial, Taylor Series & Maclaurin Series

Course Outcomes:

- CO 1 Acquire fundamental principle of differentiation.
- CO 2 Apply appropriate calculus concepts to solve various technological problems.
- CO 3 Use appropriate software and tool to solve the graphical and computational problems in calculus

BPN2032  
Fundamentals of Marketing  
Credit: 2  
Prerequisites : None

Synopsis:

The purpose of the course is to provide the students with a keen understanding of the marketing function in business firms and of the methods of using this knowledge in developing and implementing successful marketing strategies.

Course Outcomes:

- CO 1 Define marketing and describe the components of marketing process
- CO 2 Illustrate the marketplace and consumers
- CO 3 Design a Customer-Driven Marketing Strategy and Marketing Mix

BPN2023  
Industrial Engineering  
Credit: 3

Prerequisites : None

Synopsis:

Industrial Engineering concerns with the design, installation, and improvement of integrated systems of people, material, information, equipment, and energy. It draws upon specialized knowledge and skills in the mathematical, physical, and social sciences, together with the principles & methods of engineering analysis and design to specify, predict, & evaluate the results to be obtained from such systems. In this subject, the concrete principles and practical techniques to design, install, and improve the integrated system will be learnt.

Course Outcomes:

- CO 1 Synthesize an integrated system of people, material, information, equipment, and energy in problem solving and decision making
- CO 2 Synthesize an integrated system of people, material, information, equipment, and energy in problem solving and decision making
- CO 3 Practice industrial engineering principles for continuous improvement

BPN2043

Fundamentals of Electrical Engineering

Credit: 3

Prerequisites : None

Synopsis:

This module will introduce students to basic science of electricity, introduction to instrumentation and measurement, work and energy theorem, basic electrical circuits and introduction to magnetism.

Course Outcomes:

- CO 1 Apply electricity and electronic fundamentals
- CO 2 Conduct electronic experiment and solve electronic circuit problem
- CO 3 Work effectively in a team to complete a task successfully

BPN2123

Corporate Finance & Investment

Credit: 3

Prerequisites : None

Synopsis:

This course emphasizes the application of financial tools and models that produce better decisions for the firm in short and long term. Asset selection, risk management, inventory management, credit and capital acquisition, and overall value enhancement are covered. Emphasis is put on the quantitative tools and the practices of existing corporations. Students will build both broad financial knowledge and specific understanding of corporate finance. Case studies will address both large and small organizations.

Course Outcomes:

- CO 1 Examine major financial concept applications and its analysis to business environment
- CO 2 Measure and relate investment tools to investment decision making
- CO 3 Appraise capital investment project and compare for project decision making

BPN2013

Quality Management

Credit: 3

Prerequisites : None

Synopsis:

The course provides a comprehensive understanding in the fields of quality management and process improvement. The quality management principles, performance management, and quality improvement alongside relevant tools, techniques, models and frameworks will be learnt.

Course Outcomes:

- CO 1 Demonstrate a working knowledge of the principles and practices of quality management
- CO 2 Display quality tools and techniques for continuous quality improvement
- CO 3 Describe the quality implementation plans for the strategic issues in quality management

BPN2053  
ERP Systems & Business Process Management  
Credit: 3  
Prerequisites : None

Synopsis:

The aim of the course is to teach the basics about modern integrated information systems and how they are deployed in companies. A special emphasis is placed on understanding the connections between business process management and supporting business processes through integrated information systems. It also addresses the methods and techniques required to analyze, design, implement, automate, and evaluate business processes. Structured along the phases of Business Process Management life cycle, student will learn to identify appropriate technologies support, assess the role of standards, analyze organizational performance from process perspective, redesign processes, and gauge the organizational impact of process change management activities.

Course Outcomes:

- CO 1 Inquire the theoretical foundations of modern ERP systems and their application in a company
- CO 2 Construct ERP systems in real-life situations to solve specific process task (eg. Order processing, production planning, invoicing etc)
- CO 3 Demonstrate the connection between business process management and modern ERP systems

BUM2413  
Applied Statistics  
Credit: 3  
Prerequisites : None

Synopsis:

This course discusses on statistical problem-solving methodology and descriptive statistics; sampling distribution and confidence interval; hypothesis testing; analysis of variance (ANOVA); goodness-of fit

test and contingency tables; regression and correlation including simple and multiple linear regressions. Microsoft Excel software will be used in this course as a statistical package (other statistical packages are SPSS, R Language, S Plus, EViews and Minitab shall be used in this course).

Course Outcomes:

- CO 1 Acquire fundamental principle of statistics
- CO 2 Perform statistical analysis by using appropriate statistical theory and methodology
- CO 3 Analyse real life data to solve related problems in various disciplines

BPN2076  
Individual Field Project – Business & Engineering  
Credit: 6  
Prerequisites : None

Synopsis:

The individual field project offers the possibility to apply theoretical concepts and tools in a practical setting. Under supervision and with guidance of a faculty member the student works on a practical task that is typical for operational activities in production and logistics. This task can be suggested by the student, the faculty mentor or by an outside company and should involve student's at least occasional presence in a company. In any case it must be taken from a discipline covered in the semesters 1 to 4 and must clearly be application-oriented (applying theoretical know-how to real-life business & engineering situation, no theoretical task).

Course Outcomes:

- CO 1 Organize themselves and their work in an efficient manner given a clearly defined practical task
- CO 2 Gain experience in how theoretical know-how can be applied in operational tasks in a business environment
- CO 3 Integrate themselves into an existing organizational setup within a company as far as this is required to solve the assigned task

**BPN2092**

Corporate Social Responsibility (CSR) Project

Credit: 2

Prerequisites : None

**Synopsis:**

The Corporate Social Responsibility (CSR) Project familiarizes students with the theoretical concept of CSR and shows its relevance in today's business world. Students not only learn the theoretical foundations of CSR, but also actively apply the concept in a real-life example project that exemplifies the idea of making a positive and sustainable impact to society as a whole and individual stakeholder.

**Course Outcomes:**

- CO 1 Understand the concept of CSR, its elements and its importance for today's business
- CO 2 Explain the concept of CSR, its elements and its importance for today's business
- CO 3 Show individual behaviour that is in line with the principles of CSR exemplified in a real-life project

**BPN2103**

Cross-Module Seminar I

Credit: 3

Prerequisites : None

**Synopsis:**

This course gives students the opportunity to negotiate across a global supply chain. Students learn and practice methods and techniques that can be effectively used in cross-cultural negotiations. They become familiar with how to deal with the obstacles and complicating factors that might appear while applying them. They become aware of how culture and personality impact teamwork and collaboration. Working in cross functional teams, students apply knowledge from various business and engineering disciplines and have to deal with complex problems and information. The module is structured into a series of decision-making phases. The students apply the theory that they have

learned in a simulation game where they are faced with a number of critical issues for which they need to develop solutions. After each round, the students reflect on and evaluate their performance. At the end of the course, they need to submit a reflective essay in which they report upon some critical incidents experience.

**Course Outcomes:**

- CO 1 Apply knowledge from various disciplines to develop a consistent and convincing business plan
- CO 2 Apply cross-cultural or personality theories to better understand complex situations
- CO 3 Deploy problem-solving and negotiation skills to solve a complex task as a team

**BPN3023**

Operations Research

Credit: 3

Prerequisites : None

**Synopsis:**

This course introduces students to the application of quantitative methods and techniques for effective decision making in solving business problem. Various tools and theories to solve real-world problems through determining optimal solution subject to the constraints of time, labour, resources and business rules are included. The topics included are: Linear Programming, Multicriteria Decision Making, Non-Linear Programming, Queuing Theory and Simulation.

**Course Outcomes:**

- CO 1 Describe operation research concepts and techniques
- CO 2 Apply the operation research concepts and techniques in solving business problems
- CO 3 Analyze business problems and formulate operation research model to solve the problems

**BPN2113**

Supply Chain Management

Credit: 3

Prerequisites : None

Synopsis:

The subject is intended to introduce the strategic role of a supply chain from vendor to customer and the methods used to manage these supply chains. This course will provide the students with knowledge and business management skills focusing on continuous planning, developing, controlling, informing and monitoring of actions within and between supply chain links so that an integrated supply process results which meets overall strategic goals.

Course Outcomes:

- CO 1 Use the supply chain goals and managerial actions that improve supply chain performance
- CO 2 Explain strategic framework for supply chain decisions which involves planning, designing and operating processes
- CO 3 Identify the technical knowledge in solving the problems in the supply chain activities

BPN3012

Industrial Training

Credit: 12

Prerequisites: None

Synopsis

As part of the Faculty of Industrial Management with an integrated curriculum of the Bachelor of Business Engineering degree courses, all students are required to undergo industrial training for a minimum period of 24 weeks. Placement of students at various companies will be supervised and coordinated by the Industrial Training Committee set up by the faculty. Students will be placed at various companies throughout Malaysia. The training at the various companies will expose the students to a real working environment including the companies' organization structures, business operations and technology management. The hands-on experience in the training will reinforce what has been taught at the University. The students are also required to prepare an

industrial training report and do the final presentation describing the tasks they are assigned in their placement.

Course Outcomes

- CO 1 Expose students to the "real" working environment and get acquainted with the organization structure, business operations and technology management.
- CO 2 Build effective communication skills in written and oral presentation.
- CO 3 Build hands-on experience in their related field so that students can relate to and reinforce what has been taught at the University.
- CO 4 Integrate cooperation and collaboration between industry and the university in promoting a knowledgeable society.

BPN4013

Individual Study Project

Credit: 3

Prerequisites : None

Synopsis:

The individual study project focuses the student's attention on one single company or organization. The student can suggest the company and must then analyze it in a holistic manner taking into account at least the following dimensions: innovativeness (of products and processes), strategy, degree of implementation of lean philosophy, commercial position, corporate social responsibility, image / public relations. The student must combine knowledge from various disciplines and must apply different research techniques in order to prepare a comprehensive, interdisciplinary and critical report on the selected company.

Course Outcomes:

- CO 1 Combine data and information from various sources into a structured analytical description of a company (analytical thinking)
- CO 2 Critically reflect information and put it into relation to other sources in order to develop a personal critical viewpoint on a given company or organization



- (critical thinking)  
 CO 3 Arrive at own suggestions for improving the position of the company analyzed (creative thinking)

BPN4026  
 Thesis  
 Credit: 6  
 Prerequisites : None

Synopsis:

This subject exposes the students on the process of conducting academic case-based research in their respective area of study. Through this subject, students are required to conduct their individual research project independently using academic methods based on the real problem in industry. It deals in a self-contained manner with a practical problem based on empirical data and/or theory. The solution of problem should be systematically analyzed and presented.

Course Outcomes:

- CO 1 Apply the principles of academic writing and empirical research to a defined topic  
 CO 2 Practice available theories and own capabilities to solve the pre-determined research problems  
 CO 3 Practice a good attitude while fulfilling research requirements

BPN4033  
 Cross-Module Seminar II  
 Credit: 3  
 Prerequisites : None

Synopsis:

The Cross Module Seminar II combines the topics of the student's Major Specialization classes in a complex, realistic application scenario (logistics/SCM and production, respectively). The application scenario is fictitious, but closely aligned to real-life situations. Students work in small teams and develop a solution that is both technically feasible and commercially viable. They have to prepare a written solution proposal that comprises both technical (drawings and

layouts, process flows) and commercial aspects.

Course Outcomes:

- CO 1 Demonstrate ability in an interdisciplinary way  
 CO 2 Apply knowledge from various disciplines to develop a feasible solution proposal in their field of expertise  
 CO 3 Develop critical thinking when assessing the suitability of theoretical concepts to practical problems

ELECTIVE COURSES

BPE4123  
 Supply Chain Control & Management Control Systems  
 Credit: 3  
 Prerequisites : None

Synopsis:

The course familiarizes students with the basic concepts and tools of management accounting and focuses on their use within in supply chains. Special emphasis is put on the particular problems of applying these tools and concepts in an inter-organizational setting.

Course Outcomes:

- CO 1 Describe the role of the concept of supply chain control and management control systems  
 CO 2 Illustrate strategic framework for supply chain control and management control systems  
 CO 3 Use analytical knowledge in problem solving situation of supply chain control

BPE4133  
 Advanced Project Management & Control  
 Credit: 3  
 Prerequisites : None

Synopsis:

This course provides a broader perspective of knowledge, skills, methods, and techniques of

modern-day project management. The application of advanced project management information system also aims to include the value of automated tool for planning, scheduling, and controlling project. On completion of the course, students will have the core knowledge needed in project management and develop problem solving approach in managing triple constraint of time, cost, and quality in array of multidisciplinary industrial projects.

#### Course Outcomes:

- CO 1 Examine the fundamental theory and advanced concepts used in the current practices of project management.
- CO 2 Analyze standardized tools and techniques involved in effective delivery of projects.
- Co 3 Practice and utilize the project management information system to plan, execute and control broad range of projects.

BPE4143

Lean Management

Credit: 3

Prerequisites : None

#### Synopsis:

This course introduces the key concepts in lean manufacturing such as continuous improvement, just-in-time, standardization, Kanban and others. Lean focuses on eliminating waste in processes, waste being anything that impedes the flow of product as it is being transformed in the value chain. The course will examine the socio-technical interactions within a modern manufacturing organization and develop skills and processes for implementing changes for achieving agile manufacturing and global competitiveness.

#### Course Outcomes:

- CO 1 Analyze various concepts of lean systems and their applications in the manufacturing and service industry
- CO 2 Apply lean principles in initiating a continuous improvement program in an organization
- CO 3 Demonstrate lean approach by applying lean tools and techniques in

solving organization or industry problems

BPE4163

Technical Planning Case

Credit: 3

Prerequisites : None

#### Synopsis:

This course aim to give students introduction and current view of logistic and supply chain management and also best methods for responding to modern demands through various improvements in areas like capacity, logistic, warehouse and transportation strategies. With recent development of integrating fresh technologies, exploiting global markets and communicating with customers, companies nowadays prefer to focus more on sustainability and technology advancement. The concepts, tactics and applications of various logistic tools and technologies to promote bigger picture to understand logistics, warehouse and supply chain performance are also a focus in this course.

#### Course Outcomes:

- CO 1 Identify appropriate managerial action to improve warehouse and logistic performance
- CO 2 Develop strategic framework on detailed factory and warehouse planning, along with planning for global production and logistics networks
- CO 3 Demonstrate skill in communicating information and solutions that contribute to warehouse and logistics planning decision making

BPE4153

Simulation Game

Credit: 3

Prerequisites : None

#### Synopsis:

This course introduces and integrates core concepts from Business Information System and Operation Management and introduces a process-oriented view of the flows of

materials, information, products and services through and across business functions. It addresses the methods and techniques required to analyze, design, implement, automate, and evaluate business processes. Structured along the phases of Business Process Management life cycle, student will learn to identify appropriate technologies support, assess the role of standards, analyze organizational performance from process perspective, redesign processes, and gauge the organizational impact of process change management activities.

Course Outcomes:

- CO 1 Assess and improve process efficiency and effectiveness of an organization from the process perspective
- CO 2 Develop an implementation and integration strategy for processes that leverages organizational and technical capabilities
- CO 3 Analyze business processes and recognized the interactions between human behavior and process design

BPE4213  
Intra Logistics  
Credit: 3  
Prerequisites : None

Synopsis:

This course will cover tools and techniques used in the industrial logistics operations. It focuses on logistics system which includes inventory management, transportation and shipping, material management, warehousing, logistics information technology framework, international logistics and logistics system control.

Course Outcomes:

- CO1 Explain the logistics strategies and appropriate logistic approach in industrial operation
- CO2 Analyse industrial logistic problems in industrial operation management
- CO3 Solve industrial logistics problems in industry using appropriate operation management technique

BPE4223  
Distribution Logistics  
Credit: 3  
Prerequisites : None

Synopsis:

The focal point of distribution logistics is the shipment of goods from the manufacturer to the consumer. It comprises all activities related to the provision of finished products and merchandise to a customer. It also involves many different parties along the chain such as distributor, warehouse, retailer etc.

Course Outcomes:

- CO1 Appreciate logistics importance to modern business
- CO2 Explain strategic framework for logistics decisions which involves planning, designing and operating processes
- CO3 Apply technical knowledge in problem solving situation in logistics distribution

BPE4233  
International Transport Logistics  
Credit: 3  
Prerequisites : None

Synopsis:

This course will cover tools and techniques used in the industrial logistics operations. It focuses on logistics system which includes inventory management, transportation and shipping, material management, warehousing, logistics information technology framework, international logistics and logistics system control.

Course Outcomes:

- CO 1 Explain the international logistics strategies and global supply chain
- CO 2 Analyze global freight transportation and management
- CO 3 Solve international logistics problems using appropriate operation management technique

BPE4243

**Warehouse & Inventory Planning**

Credit: 3

Prerequisites : None

**Synopsis:**

The subject is intended to introduce the role of warehouse and logistics planning.

**Course Outcomes:**

- CO 1 Describe the role of warehousing
- Co 2 Explain strategic framework for logistics decisions which involves planning, designing and operating processes
- CO 3 Apply analytical knowledge in problem solving situation of logistics management

**BPE4112**

Innovation &amp; Technology Management

Credit: 2

Prerequisites : None

**Synopsis:**

This subject is intended to give an understanding on the concept of technology management and its application to an organization particularly business firm. The topics to be covered are Introduction to Management of Technology, The Role of Technology in the Creation of Wealth, Critical Factors in Managing Technology, Technology Life Cycles, The Process of Technological Innovation, Business Strategy and Technology Strategy, Competitiveness, Technology Planning and Technology Transfer.

**Course Outcomes:**

- CO 1 Demonstrate the innovation life-cycle and tools used in managing technology
- CO 2 Identify the role of technology policies, strategies and management within and between organizations in the development, operation and marketing of goods/services
- CO 3 Explain decision making techniques in the management of technology to address problems in the range of sectors

**BPE4122**

HR Management

Credit: 2

Prerequisites : None

**Synopsis:**

This course provides an overview of many issues related to managing human capital in organisation. Topics are designed to gain an understanding of how individuals in organisation grow and progress in their organisation, and what are the formal dimensions that impinge upon employees and employers, and their relationship to planning, mobility, goal-achievement, motivation and performance.

**Course Outcomes:**

- CO 1 Understand key principles underlying effective job analysis, recruitment, selection, training & development, appraisal, compensation, incentive rewards and employment law issues
- CO 2 Develop problem-solving skills by applying different approaches relevant to managing human capital
- CO 3 Acquire abilities of analyzing and examine the effects of human resource policies, strategies and management on employees' and organization's performance in reality

**BPE4132**

International Business Environment

Credit: 2

Prerequisites : None

**Synopsis:**

This course aims to expose students to the macro-environment issues that contribute to the formation of international business. Students will develop the ability to evaluate the key issues that will impact the success or failure of an international business venture.

**Course Outcomes:**

- CO 1 Discover countries differences, economics, and politics of international trade and investment and global

monetary system arising in the international business environment

- CO 2 Explain the challenges, opportunities, and threats of going global
- CO 3 Prepare a feasibility report for entering into a foreign market

BPE4212

Database Systems

Credit: 2

Prerequisites : None

Synopsis:

This course covers fundamentals of database architecture, database management systems, and database systems. Students learn how database management systems can support business processes and are made familiar with the fundamental concepts of data mining / data retrieval. They apply the concepts in a realistic enterprise scenario (capstone project).

Course Outcomes:

- CO 1 Examine user needs and process requirements in order to develop a suitable enterprise data model
- CO 2 Manipulate modern data query languages
- CO 3 Integrate basic data mining tools for example business scenarios

BPE4222

Sustainability/Energy Efficiency

Credit: 2

Prerequisites : None

Synopsis:

This subject is designed to introduce to the students the importance of energy in peoples' life and in national as well as global economic development. Student will be exposed to the different types of fossil energy supply; supply and consumption trends both at global as well as national level; as well as energy consumption in residential, commercial and industrial sectors. The course also includes discussions on the impacts of energy use on the environment and the growing need for new and renewable energy technologies.

Course Outcomes:

- CO 1 Recognize the importance of energy to human life and to economic development; energy supply and consumption trends; and how escalating energy costs will disrupt national as well as global economy.
- CO 2 Demonstrate the understanding of the national energy mix; energy use in domestic, commercial and industrial sectors; the importance of energy efficiency and conservation programmes; introduction of energy audits.
- CO 3 Relate the impact of escalating energy costs to national and global economy; and impact of energy production-to-consumption chain towards local and global environment
- CO 4 Identify the impact of the current unsustainable use of energy to future world energy scenario; and importance of developing alternative energy technologies to supplement fossil-fuel based technologies.

BPE4232

Power Management (Electrical Grid)

Credit: 2

Prerequisites : None

Synopsis:

This course introduces the emerging concepts, technologies, applications, management and the energy systems related to electrical grid and power transmission. It also covers a Smart Grid system which is more climate and consumer friendly for future sustainable energy usage.

Course Outcomes:

- CO 1 Apply the basic concept of electrical grid
- CO 2 Explain the architecture of smart grid systems and the relations among the stakeholders
- CO 3 Design a future grid system for sustainable energy usage

BPE4313

**Production Accounting & Control**

Credit: 3

Prerequisites : None

**Synopsis:**

This course familiarizes students with basic concepts and tools of management accounting in relation to production specifically. It also helps the students to focus on the importance of accounting in the manufacturing enterprises and environment in general. Special emphasis is given to focus on the key functions of management to control production cost and quality.

**Course Outcomes:**

- CO 1 Critically reflect and apply the main tools of management accounting in simplified real-life settings
- CO 2 Analyze the particular problems arising when management accounting & control is performed at the shop floor
- CO 3 Develop a suggestion for a management accounting & control system in a particular manufacturing setting

**BPE4413****Production Planning & Methods**

Credit: 3

Prerequisites : None

**Synopsis:**

The subject covers planning and controlling of production in production and operation management; concepts of JIT, MRP, MRP II, ERP, production system design, analytical techniques and concepts of production and process control in industrial management.

**Course Outcomes:**

- CO 1 Discover production planning and control approach applied in industry
- CO 2 Display appropriate production planning and control methods in solving the industrial problems
- CO 3 Demonstrate relevant industrial production planning information and data from records, database or operation processes

**BPE4423****Technical Application and Machines**

Credit: 3

Prerequisites : None

**Synopsis:**

Introduction to the techniques, and equipment of Industrial manufacturing. Emphasis on technical application such as machining, welding, casting, and forming operations.

**Course Outcomes:**

- CO 1 Understanding the basic concepts of industrial processes
- CO 2 Introduction to and analysis of common processing techniques
- CO 3 Develop the capability to make scientific decision involving industrial processes

**BPE4433****Materials Science**

Credit: 3

Prerequisites : None

**Synopsis:**

The purpose of this course is to provide a general background of the field of material science and engineering. Fundamental topics such as chemical bonding in materials, crystal structure and defects, diffusion and phase diagram will be introduced. Then mechanical properties of materials will be covered and information of types of material and their applications be provided.

**Course Outcomes:**

- CO 1 Introduce the fundamentals of chemistry of engineered materials
- CO 2 Expand the understanding of the classes of materials
- CO 3 Develop the capability to make scientific decision involving material selection and processing

**BPE4443****Product Engineering**

Credit: 3

Prerequisites : None

Synopsis:

Maintaining the competitiveness of companies requires going into foreign markets and being differentiated from the competition by something more than simply differences in costs. In this context, being capable of introducing new products into the market at high quality levels, constitutes the best strategy. This course helps the students to understand the strategic and operational aspects that a company has to command in order to have an efficient and effective development process for new products.

Course Outcomes:

- CO 1 Understanding the strategic and operational aspects of the process of product development
- CO 2 Having knowledge of the most advanced tools and practicing on it
- CO 3 Attain a balance between theory and practical

BPE4453

Electrical Drives

Credit: 3

Prerequisites : None

Synopsis:

Electric motors are extensively used in many stages of industrial processes. Since 70% of global electricity generation is consumed by electric motors, it is essential to design efficient electric drives to increase system reliability and to lower operational costs in a plant. Substantial energy savings can be obtained by employing advanced control and semiconductor power converter technologies combined with a suitable selection of electric motor type and rating. This course is intended primarily to provide a fundamental knowledge of modeling, analysis and integration of mechanical and electrical components and to introduce various aspects of design and control techniques in electrical drive applications, such as manufacturing lines, electric transportation, air-conditioning and ventilating, crane and hoist applications, etc. The energy systems related to electrical grid and power transmission. It also covers a

Smart Grid system which is more climate and consumer friendly for future sustainable energy usage.

Course Outcomes:

- CO 1 To demonstrate knowledge of classical electric machines
- CO 2 To analyze equivalent circuit representatives for modelling the drive characteristics
- CO 3 To integrate principal methods of control in variable-speed drive system

## CURRICULUM STRUCTURE BACHELOR OF INDUSTRIAL TECHNOLOGY MANAGEMENT WITH HONOURS

YEAR	FIRST	SECOND	THIRD	FOURTH
	BPC1113 Principles of Management	BPC2113 Quality Management	BPC3213 Production Planning & Control	BPC4114 Final Year Project 2
	BPC1143 Industrial Psychology	BPC2213 Financial Management	BPC3223 Quality control	BPC4112 Industrial Training
	BPC1123 Principles of Economics	BPC2223 Supply Chain & Logistics Management	BPC3113 Research Methodology	BPE4513/BPE4813 Elective Course 4
	BPC1133 Principles of Marketing	BPC2123 Organizational Behaviour	BPC3233 Business Law	BPE4523/BPE4823 Elective Course 5
	BPC11223 Principles of Operation Management	BPC2233 Project Management	BPC3123 Strategic Management	BPE4533/BPE4833 Elective Course 6
<b>COURSES</b>	BPC1153 Business Information System	BPC2243 Fundamental of Manufacturing	BPC3243 Production Development & Innovation	
	BPC1213 Management Accounting	BPC2253 Management of Technology	BPC3132 Final Year Project 1	
	BUM1123 Mathematics for Management	BUM2433 Statistics for Management	BPE3513/BPE3813 Elective Course 1	
			BPE3523/BPE3823 Elective Course 2	
			BPE3533/BPE3833 Elective Course 3	
<b>102</b>	<b>24</b>	<b>24</b>	<b>29</b>	<b>25</b>
	<b>University Courses:</b>			
<b>18</b>	Co-Curriculum, Technopreneurship, Falsafah dan Isu Semasa, Penghayatan Etika & Peradaban, Foreign Languages Level 1, Foreign Languages Level 2, Fundamentals of English Language, English for Academic Communication English for Professional Communication, English for Technical Communication, Soft Skills			
<b>120</b>	<b>TOTAL CREDIT FOR GRADUATION</b>			



**ELECTIVE COURSES FOR  
BACHELOR OF INDUSTRIAL TECHNOLOGY MANAGEMENT WITH HONOURS**

ELECTIVES	CODE	COURSE	CREDIT HOUR
OPERATION MANUFACTURING	BPE3513	Computer Aided Design	3
	BPE3523	ERP Systems	3
	BPE3533	Lean Manufacturing	3
	BPE4513	Manufacturing Technology	3
	BPE4523	Computer Modelling & Simulation	3
	BPE4533	Industrial Control Automation	3
SERVICE MANAGEMENT	BPE3813	Customer Relationship Management	3
	BPE3823	Service Management	3
	BPE3833	Knowledge Management	3
	BPE4813	Service Marketing	3
	BPE4823	Innovation Management	3
	BPE4833	Retailing	3

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Graduates will be member of managerial team in any industries
PEO2	Graduates will engage in research, consultation and service management
PEO3	Graduates engage in lifelong learning and wealth development

**PROGRAMME OUTCOMES (PO)**

PO1	Apply knowledge of concepts, theories and disciplines that underpin industrial technology management.
PO2	Demonstrate self-direction and originality in solving industrial technology management problems, and act autonomously in planning and managing.
PO3	Demonstrate skills of critical thinking in solving complex industrial technology management problems.
PO4	Express complex and sophisticated ideas fluently and comprehensively using a range of formats and media.
PO5	Able to conduct activities with good social skills and demonstrate a sense of responsibility.
PO6	Engage in continuous learning to improve knowledge and enhance information management skills.
PO7	Possess entrepreneurial and managerial skills through knowledge and understanding in industrial management and technology.
PO8	Attain professionalism, values and ethics in managing business.
PO9	Acquire leadership and team-building skills and the ability to coordinate the relevant tasks and programs.

**COURSE SYNOPSIS****COURSE SYNOPSIS FOR BACHELOR OF INDUSTRIAL TECHNOLOGY MANAGEMENT WITH HONOURS****CORE FACULTY COURSES**

BPC1113

Principles of Management

Credit: 3

Prerequisites: None

**Synopsis**

This course serves as an introduction to the discipline of management. It is designed to integrate the accepted theories in the area with real world applications to provide students with the basic knowledge and skills needed for managing others. This course begins with a discussion of the current issues in management and then proceeds to cover the traditional functions of management: planning, organizing, leading, and controlling. Contemporary issues and global challenges for future managers will also be discussed to equip students with current trends and best practices in managing a successful organization.

**Course Outcomes**

- CO 1 Apply the Principles of Management in solving various issues and global challenges
- CO 2 Identify good practices of management functions in managing event
- CO 3 Compare various management styles of contemporary approaches in current setting

BPC1123

Principles of Economics

Credit: 3

Prerequisites: None

**Synopsis**

This course is designed to introduce students to key concepts used in microeconomics and macroeconomics, and to facilitate a basic understanding of economic phenomena. The goals will help students to understand fundamental concepts and tools so that

students can use them to analyse various economic issues. This course is primarily concerned with Malaysian economy and will help them understand how economy works.

**Course Outcomes**

- CO 1 Explain the basic Macro & Micro economic concepts.
- CO 2 Explain the usage of economics concepts for business phenomena.
- CO 3 Demonstrate the usage of the economic models for business management decision making.

BPC1143

Industrial Psychology

Credit: 3

Prerequisites: None

**Synopsis**

This course provides an overview of different personnel, work environment and organizational issues to be investigated in industrial psychology. The major application of psychology at work place is covered. The management of human capital and their issues like selection, training, evaluation, relationship at work place and related aspects are focused.

**Course Outcomes**

- CO 1 Analyze and understand theories of Industrial Psychology and management of human capital.
- CO 2 Demonstrate the issues relating of work behavior of employees and the human capital management.
- CO 3 Describe human resource skills for effective industrial management.

BPC1153

Business Information System

Credit: 3

Prerequisites: None

**Synopsis**

This course aims to provide firm understanding on the significance and strategic role of information system to the organization particularly in supporting wide

range of business functions across the corporate environment. The lecture shall cover theoretical part which cover the foundation of information systems, information technology infrastructure and contemporary issues on information security. Lab session aims to provide students with hands-on and practical experience on the usage of office automation systems, developing database as well as exploring selected approach in information system development.

#### Course Outcomes

- CO 1 Explain significance and roles of information systems in achieving organizational competitive advantage.
- CO 2 Apply various strategies and approaches in information system development.
- CO 3 Demonstrate the usage of office automation system in performing operational tasks and managing information resources within organization.

#### BPC1133

Principles of Marketing

Credit: 3

Prerequisites: None

#### Synopsis

This course serves as an introduction to the discipline of management. It is designed to integrate the accepted theories in the area with real world applications to provide students with the basic knowledge and skills needed for managing others. This course is designed to provide students with an understanding of marketing mix components; explain the environmental factors which influence consumer and organizational decision-making processes; outline a marketing plan; and how marketing works in today's marketing environment.

#### Course Outcomes

- CO 1 Explain the Principles of Marketing in solving various issues.
- CO 2 Follow a comprehensive marketing plan to real or imaginary products.
- CO 3 Propose persuasive marketing programs

#### BUM1123

Mathematics for Management

Credit: 3

Prerequisites: None

#### Synopsis

This course introduces the use of mathematical technique in the field of business administration and management. The topics introduce the inequality, matrices, functions and the key business topics such as simple interest, compound interest, annuity, notes and bank discount, mathematics of buying, markup and markdown.

#### Course Outcomes

- CO 1 Use the basic principle and methodologies of mathematics to solve the mathematical analysis problems.
- CO 2 Use scientific calculator to solve the exponential and logarithmic functions.
- CO 3 Apply the mathematical concepts and the usage of the mathematical technique in business administration and management.

#### BPC2113

Quality Management

Credit: 3

Prerequisites: None

#### Synopsis

The course will provide students with a comprehensive understanding and focuses on quality management principles, performance management and quality improvement alongside relevant tools, techniques, models and frameworks. It is suitable for undergraduates who require to develop knowledge, understanding and business management skills in the fields of quality management and process improvement.

#### Course Outcomes

- CO 1 Demonstrate a working knowledge of the principles and practice of quality management.
- CO 2 Explain the quality tools and techniques for continuous quality improvement.

CO 3 Prepare a quality implementation plans for the strategic issues in quality management.

BPC2123

Organizational Behaviour

Credit: 3

Prerequisite: BPC1143 Industrial Psychology

Synopsis

This course provides an analysis of human behavior at work place. The behavior of individual, interpersonal, team and organizational levels. The development of interpersonal competencies to allow individuals to effectively work as managers or professionals in the rapidly changing, culturally diverse and technologically integrated global climate facing modern organizations. The topics like personality, attitude, perception, leadership are covered.

Course Outcomes

- CO 1 Classify theories of Organizational Behavior.
- CO 2 Demonstrate the issues relating of human behavior at work place and related issues.
- CO 3 Report human behavior skills for development of organization.

BUM2433

Statistics for Management

Credit: 3

Prerequisites: None

Synopsis

This course discusses on descriptive statistics; graphical summary; common probability distributions; statistical analysis for means; regression and correlation including simple and multiple linear regressions, and goodness of fit test and contingency tables. Statistical packages such as Microsoft Excel, SPSS, R Language, S Plus, EViews and Minitab shall be used in this course.

Course Outcomes

- CO 1 Acquire fundamental principle of statistics.

CO 2 Perform statistical analysis by using appropriate statistical theory and methodology.

CO 3 Analyse real life data to solve related problems in various disciplines.

BPC3113

Research Methodology

Credit: 3

Prerequisites: None

Synopsis

This course is designed to introduce students to the research methods that can be applied when conducting research projects. The topics to be covered include Introduction to research, approaches to research, problem statement, research objective, research question, literature reviews, theoretical framework and hypothesis development, research design, case study research, data collection method, measurement, sampling, data analysis, introduction to Excel/SPSS and writing the research proposal, poster and article.

Course Outcomes

- CO 1 Differentiate between qualitative and quantitative research method.
- CO 2 Construct research proposals by using appropriate research methods.
- CO 3 Propose research methods for problem solving.

BPC3123

Strategic Management

Credit: 3

Prerequisites: None

Synopsis

This course exposes students on the aspects of strategic management in business environment. The covered areas for this course are: the nature of strategic management; external and internal assessment; strategic analysis and choice; strategy implementation; and strategic evaluation and control.

Course Outcomes

- CO 1 Analyze the strategic management concepts and techniques.
- CO 2 Demonstrate the strategic management concepts and techniques in business environment.
- CO 3 Initiate strategy choice for implementation.

#### BPC3132

Final Year Project I

Credit: 2

Prerequisites: BPC3113 Research Methodology

#### Synopsis

This course will expose the students on the process of conducting academic research in order to provide the skills and ability in carrying out research project in the area of their study. The covered areas for Final Year Project 1 are: (i) problem background, (ii) problem statement, (iii) research objectives, (iv) research questions, (v) research framework, (vi) literature reviews, and (vii) research methods.

#### Course Outcomes

- CO 1 Produce problem statement and research objective in the chosen industrial management field.
- CO 2 Manipulate the reliable sources for exceptional, detail and accurate literature review.
- CO 3 Construct noble research work by producing the feasible flow of methodology.
- CO4 Build effective skills in report writing and oral presentation- through overall report contents and oral presentation session.
- CO5 Demonstrate good attitude to fulfill research requirements.

#### BPC4114 (Semester 7/4)

Final Year Project 2

Credit: 4

Prerequisite: BPC3132 Final Year Project I

#### Synopsis

This course will expose the students on the process of conducting academic research in

order to provide the skills and ability in carrying out research project in the area of their study. The covered areas for Final Year Project II are: (i) development of research instruments for data collection, (ii) carrying out data collection, (iii) analysing data collected, (iv) interpreting data, (v) writing reports.

#### Course Outcomes

- CO 1 Produce validated research instrument.
- CO 2 Organize the research findings based on theoretical knowledge.
- CO 3 Construct the conclusion of the research and recommendation for improvement.
- CO4 Build an effective skill in report writing and oral presentation through overall report contents and oral presentation session.
- CO5 Demonstrate a good attitude to fulfill research requirements.

#### BPC4112

Industrial Training

Credit: 12

Prerequisites: All core faculty and core programme courses from Semester 1 to Semester 7

#### Synopsis

As part of the Faculty of Industrial Management with an integrated curriculum of the Bachelor of Project Management degree courses, all students are required to undergo industrial training for a minimum period of 24 weeks. Placement of students at various companies will be supervised and coordinated by the Industrial Training Committee set up by the Faculty. Students will be placed at various companies throughout Malaysia. The training at the various companies will expose the students to a real working environment including the companies' organization structures, business operations and technology management. The hands-on experience in the training will reinforce what has been taught at the University. The students are also required to prepare an industrial training report and do the final presentation describing the tasks they are assigned in their placement.

**Course Outcomes**

- CO 1 Expose students to the "real" working environment and get acquainted with the organization structure, business operations and technology management.
- CO 2 Build effective communication skills in written and oral presentation.
- CO 3 Build hands-on experience in their related field so that students can relate to and reinforce what has been taught at the University.
- CO 4 Integrate cooperation and collaboration between industry and the university in promoting a knowledgeable society.

**CORE PROGRAM COURSES**

BPQ1213

Management Accounting

Credit: 3

Prerequisites: None

**Synopsis**

This course is an introductory course and enables students to understand the basic concepts and terminology of accounting and financial reporting for modern business enterprises. The students will learn to apply accounting information for business activities decision. The course will equip students with understanding and application on context of management accounting, cost identification and behavior, standard costing, financial planning and control and accounting control systems.

**Course Outcomes**

- CO 1 Solve accounting problems by applying the accounting method in a business setting
- CO 2 Display cost for business using the principles of costing systems
- CO 3 Explain the business activities base on management accounting principles and concepts

BPQ1223

Principles of Operation Management

Credit: 3

Prerequisites: None

**Synopsis**

The course provides a range of academic knowledge, operations understanding, operational management techniques. It will focus on the main decision areas of operations management and their impact on business functions and the role of the operations manager and the relationship with productivity improvement.

**Course Outcomes**

- CO 1 Apply the fundamental concept and the main areas of operation management
- CO 2 Demonstrate operation decisions in solving operational problems
- CO 3 Justify operations management requirements

BPQ2213

Financial Management

Credit: 3

Prerequisites: None

**Synopsis**

This course is an introductory course and enables students to understand the basic concept of finance in an organization. Students will define concepts, characteristics, features and analyzing related financial statements. The course will equip students with understanding and application of finance which cover on financial strategy, debt and equity management, the key drivers of shareholders value, risk and return concept in investment, and capital budgeting as vehicles to evaluate investment choices.

**Course Outcomes**

- CO 1 Analyze financial management problems by using all concepts in financial management
- CO 2 Calculate and utilize financial formula to a particular area in financial management
- CO 3 Explain the key driven in financial management and its importance in an organization

BPQ2223

**Supply Chain & Logistics Management**

Credit: 3

Prerequisites: None

**Synopsis**

The course covers supply chain and logistics management in business environment which includes concepts of SCM, logistics, sourcing strategy, supply chain risk, purchasing, distribution, transportation, facilities location, demand forecasting, inventory, pricing strategy and information technology used in industrial system and operation management.

**Course Outcomes**

- CO 1 Illustrate the roles of supply chain and logistics management in the industry
- CO 2 Explain supply chain and logistics management methods and concepts in solving related industrial operation and system problems
- CO 3 Present operation information and data from various records and database utilized for industrial supply chain and logistics management application

**BPQ2233****Project Management**

Credit: 3

Prerequisite: None

**Synopsis**

This course provides foundation and knowledge of project management. Students will be exposed to various body of knowledge and institutions related to project management in particular to Project Management Institute (PMI). Through Out semester, students be give the well-round knowledge of theories, project management process and the skills required to manage a project effectively. Last but not least, students also will have opportunity to explore various methods and approaches of project management and project management software.

**Course Outcomes**

- CO 1 Explain concept of project management process according to selected body of knowledge and

organizational influence towards project management success.

- CO 2 Identify best-fit project management software for the organization.
- CO 3 Demonstrate understanding of project life-cycle management according to different industries

**BPQ2243****Fundamental of Manufacturing**

Credit: 3

Prerequisites: None

**Synopsis**

Manufacturing have become important in the industrial environment to produce products for the services of mankind. The knowledge gained from this course is highly essential as it prepares the students to be familiar with modern concepts of manufacturing technologies. Students will be exposed theoretically to the manufacturing processes, safety measures, fundamental of material properties and measurement, tools and equipment used, and the manufacturing system.

**Course Outcomes**

- CO 1 Describe the appropriate material required in manufacturing technology
- CO 2 Differentiate the manufacturing technology alternatives based on selected material
- CO 3 Identify the appropriate manufacturing technology for modern concepts of manufacturing

**BPQ2253****Management of Technology**

Credit: 3

Prerequisites: None

**Synopsis**

This subject is intended to give an understanding on the concept of technology management and its application to an organization particularly business firm. The topics to be covered are: Introduction to Management of Technology, Critical Factors

and essential issues in Managing Technology, Technology Life Cycles, Technology Forecasting, Technology strategy and planning tools, Technological Innovation, transfer and Technological Competitiveness.

#### Course Outcomes

- CO 1 Produce the general terms, definitions, principles used in the various topics of management of technology.
- CO 2 Analyze the technical tools or models in formulating technology policies and strategies within and between organizations in the development, operation and marketing of goods and/or services.
- CO 3 Demonstrate decision making techniques in the management of technology to address problems in the range of sectors.

BPQ3213

Production Planning and Control

Credit: 3

Prerequisites: None

#### Synopsis

The subject covers planning and controlling of production in production and operation management; concepts of production planning techniques, analytical techniques and system designs and concepts of production and process control in industrial management.

#### Course Outcomes

- CO 1 Analyse industrial production planning and control problems
- CO 2 Apply production planning and control methods for solving industrial operation problems
- CO 3 Respond to production planning and control requirements

BPQ3223

Quality Control

Credit: 3

Prerequisites: BPC2113 Quality Management

#### Synopsis

The subject is designed to introduce methods for data collection, control chart construction and interpretation, and statistical diagnosis for quality control. The course blends statistical process control (SPC) and principles of statistics for quality control and process improvement purpose. It also covers process capability, acceptance sampling methods and reliability.

#### Course Outcomes

- CO 1 Apply statistics principles in data analysis for quality control.
- CO 2 Display results of statistical process control, control charts, with the help of minitab software.
- CO 3 Study SPC, control chart, acceptance sampling and reliability technique in solving industrial quality problems for quality control and improvements.

BPQ3233

Business Law

Credit: 3

Prerequisites: None

#### Synopsis

This subject introduces fundamental legal knowledge in relation to business activities and commercial transactions by focusing on relevant legal theories, principles and aspects and their application within Malaysian legal framework and global business environment. The students will be exposed to the concept of law, legal system and legal liabilities in commercial contracts, commercial crime, tort, consumerism and intellectual property. Upon completing this subject, students will have the understanding on the mechanics of law and its significance to business

#### Course Outcomes

- CO 1 Explain the substantial and procedural aspects of Malaysian business law
- CO 2 Analyze appropriate legal frameworks for commercial activities and business ventures.
- CO 3 Integrate the application of legal knowledge in commercial decision-making.



**BPQ3243**

Product Development and Innovation

Credit: 3

Prerequisites: None

**Synopsis**

The course is intended to give an in-depth understanding of the entire process of new product development, as it should operate within modern production industry which encompassing both the design and development, covering not only of the visual appearance of products but also design for manufacturing, design to meet market needs, design for cost reduction, design for reliability and design for environmental friendliness.

**Course Outcomes**

- CO 1 Apply technical knowledge in problem solving using appropriate software and management techniques for new product development
- CO 2 Display new products by utilizing appropriate techniques to stimulate creativity and innovation for product design application.
- CO 3 Manage relevant industrial product development information and data from various records, database or publications

**ELECTIVE COURSES****BPE3513**

Computer Aided Design (E)

Credit: 3

Prerequisites: None

**Synopsis**

The subject is intended to provide students with introduction and theoretical understanding of computer-aided technologies used in design (CAD). Students are exposed to various problem solving techniques as well as hands-on experience and project-based approach in the aspects of industrial product design and development

**Course Outcomes**

- CO 1 Demonstrate product design and development and computer-aided

design (CAD).

- CO 2 Construct basic design work and product development functions by using selected CAD software

- CO 3 Complete the understanding by solving problems in design and product development using selected CAD software.

**BPE3523**

ERP Systems (E)

Credit: 3

Prerequisites: None

**Synopsis**

This course is aimed to teach the students about the basics on modern integrated information systems and how they are deployed in companies. A special emphasis is placed on understanding the connections between business process management and supporting and supporting business processes through integrated information systems.

**Course Outcomes**

- CO 1 Differentiate the theoretical foundations of modern ERP systems and their application in a company
- CO 2 Construct ERP systems in real-life situations to solve specific process task (eg. Order processing, production planning, invoicing etc.
- CO 3 Demonstrate the connection between business process management and modern ERP systems

**BPE3533**

Lean Manufacturing (E)

Credit: 3

Prerequisite: None

**Synopsis**

This course introduces the key concepts in lean manufacturing such as continuous improvement, just-in-time, standardization, kanban and others. Lean focuses on eliminating waste in processes, waste being anything that impedes the flow of product as it is being transformed in the value chain. The course will examine the socio-technical

interactions within a modern manufacturing organization and develop skills and processes for implementing changes for achieving agile manufacturing and global competitiveness.

Course Outcomes

- CO 1 Apply lean principles in initiating a continuous improvement program in an organization
- CO 2 Analyze various concepts of lean systems and their applications in the manufacturing and service industry
- CO 3 Demonstrate lean approach by applying lean tools and techniques in solving organization or industry problems

BPE3813

Customer Relationship Management (E)

Credit: 3

Prerequisites: None

Synopsis

This course is designed to introduce students to both CRM fundamentals and the utilization of technology in managing customers. The curriculum will introduce students to CRM concepts and functionality for professionals whose organizations utilize CRM or want to gain an understanding of the role of CRM in service management.

Course Outcomes

- CO 1 Analyse the key concepts, technologies and best practices of CRM in Service industry.
- CO 2 Integrate CRM and technologies practices to enhance the achievement of marketing, sales and service objectives.
- CO 3 Explain the impact of CRM on customer experience, satisfaction and loyalty.

BPE3823

Service Management (E)

Credit: 3

Prerequisites: None

Synopsis

The main aim of this subject is to expose the

students to the real service market scenario. It considers the complexity of services that bring together a mesh of organisations, people, technologies, strategies and information to deliver value to the customer. The strategic and competitive focus also provides those students who are interested in entrepreneurial endeavours with the foundation necessary to open their own service business.

Course Outcomes

- CO 1 Analyse fundamental ideas of managing services
- CO 2 Integrate the role of technology, operations, and human behaviour towards a better service management
- CO 3 Point out challenges of managing different types of service operations by learning strategies to overcome it.

BPE3833

Knowledge Management (E)

Credit: 3

Prerequisites: None

Synopsis

Knowledge management as an organizational innovation has reached a state of maturity where we can now discern the principles, practices, and tools that make it unique. It has engendered new concepts and categories for us to make sense of the many important ways that organizations use knowledge to create value. So this course is designed to present a thoughtful, systematic view of knowledge management as a coherent body of management theory and practice. The topics will include: introduction to knowledge management in theory and practice, the knowledge management cycle, knowledge management models, knowledge capture and codification, knowledge sharing and communities of practice, knowledge application, the role of organizational culture, knowledge management tools, KM strategy and metrics, the KM team, and future challenges for KM.

Course Outcomes

- CO 1 Compare the definitions and perspectives of knowledge and knowledge management.

- CO 2 Manipulate knowledge management tools to suit various organizational contexts in facilitating the business operation.
- CO 3 Prepare framework of implementing knowledge management to address problems in organizations.

BPE4513  
Manufacturing Technology (E)  
Credit: 3  
Prerequisites: BPQ2243  
Fundamental of Manufacturing

#### Synopsis

This subject is intended to introduce manufacturing processes as used by industries to transform raw material to a final product: covering basic principles in metal forming, casting, joining and machining processes. The subject also covers other essential processes such as bulk deformation processes, powder metallurgy and surface treatments. Besides theoretical learning, students are also will be expose to the practical experiences related to basic manufacturing works which are common to the production industries.

#### Course Outcomes

- CO 1 Analyze the fundamentals of manufacturing technology applicable to industrial production processes
- CO 2 Manipulate the compatibility of manufacturing technology alternative with product specification for industrial production processes
- CO 3 Demonstrate basic manufacturing work as practiced by production industries

BPE4523  
Computer Modelling & Simulation (E)  
Credit: 3  
Prerequisites: None

#### Synopsis

This course demonstrates how to construct a computer representation of a real world system. A developed simulation model can be

used to aid decision making by providing information and predicts how the real-world system behaves under a variety of circumstances. Students will develop both discrete event simulation and system dynamics models with the aid of ARENA and iThink simulation software.

#### Course Outcomes

- CO 1 Design logical models to represent real world systems
- CO 2 Simulate real world systems using simulation software
- CO 3 Analyze data and output of the simulation model

BPE4533  
Industrial Control and Automation (E)  
Credit: 3  
Prerequisites: None

#### Synopsis

This course will provide the students with basic skills useful in identifying the concepts of automated machines and equipment and describe the terms and phrases associated with industrial automation in manufacturing applications. Topics to be covered include automation technologies and control, industrial automation instruments and devices, process control system classification and programmable logic control applications.

#### Course Outcomes

- CO 1 Explain the general function of industrial automation systems
- CO 2 Demonstrate basic Programmable Logic Control (PLC) skills
- CO 3 Differentiate types of process control devices

BPE4813  
Service Marketing (E)  
Credit: 3  
Prerequisites: None

#### Synopsis

This course focuses on the Formulation, Implementation and Evaluation of Service Marketing Execution. From understanding service products, consumers and markets, applying the marketing Principles on services;

to managing the customer interface and finally implementing profitable service strategies, this course immerses students into the current issues of services marketing.

#### Course Outcomes

- CO 1 Distinguish the differences between goods and services marketing.
- CO 2 Identify the various components of the “services marketing mix” (three additional P’s) as well as key issues required in managing service quality.
- CO 3 Analyze various methods of achieving competitive advantages in services marketing practice.

BPE4823

Innovation Management (E)

Credit: 3

Prerequisites: None

#### Synopsis

This course intends to provide an understanding of the innovation management concepts by developing a deeper understanding of the steps involved in the development of new products and services, and the strategies in managing product and service innovation to deliver superior value to customers. Specific course objectives address innovation, services & product management issues starting from product development, innovation management up to product marketing approach.

#### Course Outcomes

- CO 1 Review various options for the marketing and management of product and service innovation using both theoretical and practical approaches
- CO 2 Plan the implementation of the entire process related to the launch of a selected product or service
- CO 3 Critically appraise the viability of a new product or service launch

BPE4833

Retailing (E)

Credit: 3

Prerequisites: None

#### Synopsis

This course intends to provide an understanding of fundamentals of retailing. The topics covered include introduction of retailing, operation management, developing merchandise plan, financial. Students will be exposed to various case studies on successful domestic and international business

#### Course Outcomes

- CO 1 Assemble knowledge of contemporary retail management business opportunities
- CO 2 Integrate key contents and structure of retail plan
- CO 3 Develop retailing business plan for small to medium size enterprise which integrates marketing, sale, operation, finance and

## CURRICULUM STRUCTURE BACHELOR OF PROJECT MANAGEMENT WITH HONOURS

YEAR	FIRST	SECOND	THIRD	FOURTH
<b>CORE COURSES</b>	BPC1113 Principles of Management	BPM2313 Project Financial Management	BPM3313 Project Control	BPC4114 Final Year Project 2
	BPC1143 Industrial Psychology	BPM2323 Project Estimating & Budgeting	BPC3123 Strategic Management	BPC4112 Industrial Training
	BPC1123 Principles of Economics	BPM2333 Planning & Scheduling	BPC3113 Research Methodology	BPE4613/BPE4713 Elective Course 4
	BPC1133 Principles of Marketing	BPM2343 Integrated Project Management 1	BPM3323 Project Risk Management	BPE4623/BPE4723 Elective Course 5
	BPM1313 Project Management	BPC2113 Quality Management	BPP3333 Stakeholder Management	BPE4633/BPE4733 Elective Course 6
	BPC1153 Business Information System	BPC2123 Organizational Behaviour	BPM3343 Project Portfolio Management	
	BUM1123 Mathematics for Management	BPM2353 Procurement Management	BPC3132 Final Year Project I	
		BPM2363 Integrated Project Management 2	BPE3613/BPE3713 Elective Course 1	
		BUM2433 Statistics for Management	BPE3623/BPE3723 Elective Course 2	
			BPE3633/BPE3733 Elective Course 3	
<b>102</b>	<b>21</b>	<b>27</b>	<b>29</b>	<b>25</b>
<b>18</b>	<b>University Courses</b> Co-Curriculum, Technopreneurship, Falsafah dan Isu Semasa, Penghayatan Etika dan Peradaban, Foreign Languages, Fundamentals of English Language, English for Academic Communication, English for Professional Communication, English for Technical Communication, Soft Skills			
<b>120</b>	<b>TOTAL CREDIT FOR GRADUATION</b>			

**ELECTIVE COURSES FOR  
BACHELOR OF PROJECT MANAGEMENT WITH HONOURS**

<b>ELECTIVES</b>	<b>CODE</b>	<b>COURSE</b>	<b>CREDIT HOUR</b>
<b>CONSTRUCTION</b>	BPE3613	Construction Management	3
	BPE3623	Construction Technology	3
	BPE3633	Construction Drawings & Measurement	3
	BPE4613	Construction Economics	3
	BPE4623	Industrial Safety and Health	3
	BPE4633	Construction and Sustainability Development	3
<b>INFORMATION TECHNOLOGY</b>	BPE3713	Introduction to Software Engineering	3
	BPE3723	Introduction to Computer Network & Security	3
	BPE3733	System Analysis and Design	3
	BPE4713	Integrated Media Application for Business	3
	BPE4723	Business Analytics	3
	BPE3713	Introduction to Software Engineering	3

**PROGRAMME EDUCATIONAL OBJECTIVES (PEO)**

PEO1	Graduates will be project professionals for business and industries as well as government sectors in many different specialized fields with corresponding professional designations
PEO2	Graduates will continue their studies at advance educational program and professional certifications
PEO3	Graduates will engage in research and wealth development

**PROGRAMME OUTCOMES (PO)**

PO1	Apply knowledge of concepts, theories and disciplines that underpin business and management.
PO2	Demonstrate self-direction and originality in solving problems, and act autonomously in planning and managing.
PO3	Demonstrate cognitive skills of critical thinking to solve complex business problems.
PO4	Express complex and sophisticated ideas fluently and comprehensively using a range of formats and media.
PO5	Able to conduct activities with good social skills and demonstrate a sense of responsibility.
PO6	Engage in continuous learning to improve knowledge and enhance information management skills.
PO7	Possess entrepreneurial and managerial skills through knowledge and understanding in business administration.
PO8	Attain professionalism, values and ethics in managing project and administrations.
PO9	Acquire leadership and team-building skills and the ability to coordinate relevant tasks and programs.

## COURSE SYNOPSIS

### COURSE STRUCTURE FOR BACHELOR OF PROJECT MANAGEMENT WITH HONOURS

#### CORE FACULTY COURSES

BPC1113  
Principles of Management  
Credit: 3  
Prerequisite: None

#### Synopsis

This course serves as an introduction to the discipline of management. It is designed to integrate the accepted theories in the area with real world applications to provide students with the basic knowledge and skills needed for managing others. This course begins with a discussion of the current issues in management and then proceeds to cover the traditional functions of management: planning, organizing, leading, and controlling. Contemporary issues and global challenges for future managers will also be discussed to equip students with current trends and best practices in managing a successful organization.

#### Course Outcomes

- CO 1 Apply the Principles of Management in solving various issues and global challenges
- CO 2 Identify good practices of management functions in managing event
- CO 3 Compare various management styles of contemporary approaches in current setting

BPC1143  
Industrial Psychology  
Credit: 3  
Prerequisite: None

#### Synopsis

This course provides an overview of different personnel, work environment and organizational issues to be investigated in industrial psychology. The major application of psychology at work place is covered. The management of human capital and their

issues like selection, training, evaluation, relationship at work place and related aspects are focused.

#### Course Outcomes

- CO 1 Analyze and understand theories of Industrial Psychology and management of human capital.
- CO 2 Demonstrate the issues relating of work behaviour of employees and human capital management.
- CO 3 Describe human resource skills for effective industrial management.

BPC1123  
Principles of Economics  
Credit: 3  
Prerequisite: None

#### Synopsis

This course is designed to introduce students to key concepts used in microeconomics and macroeconomics, and to facilitate a basic understanding of economic phenomena. The goals will help students to understand fundamental concepts and tools so that students can use them to analyse various economic issues. This course is primarily concerned with Malaysian economy and will help them understand how economy works.

#### Course Outcomes

- CO 1 Explain the basic Macro & Micro economic concepts.
- CO 2 Explain the usage of economics concepts for business phenomena.
- CO 3 Demonstrate the usage of the economic models for business management decision making.

BPC1133  
Principles of Marketing  
Credit: 3  
Prerequisite: None

#### Synopsis

This course serves as an introduction to the discipline of management. It is designed to integrate the accepted theories in the area with real world applications to provide

students with the basic knowledge and skills needed for managing others. This course is designed to provide students with an understanding of marketing mix components; explain the environmental factors which influence consumer and organizational decision-making processes; outline a marketing plan; and how marketing works in today's marketing environment.

#### Course Outcomes

- CO 1 Explain the Principles of Marketing in solving various issues.
- CO 2 Follow a comprehensive marketing plan to real or imaginary products.
- CO 3 Propose persuasive marketing programs

#### BPC1153

Business Information System

Credit: 3

Prerequisite: None

#### Synopsis

This course aims to provide firm understanding on the significance and strategic role of information system to the organization particularly in supporting wide range of business functions across the corporate environment. The lecture shall covers theoretical part which cover the foundation of information systems, information technology infrastructure and contemporary issues on information security. Lab session aims to provide students with hands-on and practical experience on the usage of office automation systems, developing database as well as exploring selected approach in information system development.

#### Course Outcomes

- CO 1 Explain the significance and roles of information systems in achieving organizational competitive advantage.
- CO 2 Apply various strategies and approaches in information system development.
- CO 3 Demonstrate the usage of office automation system in performing operational tasks and managing information resources within organization.

#### BUM1123

Mathematics for Management

Credit: 3

Prerequisite: None

#### Synopsis

This course introduces the use of mathematical technique in the field of business administration and management. The topics introduce the inequality, matrices, functions and the key business topics such as simple interest, compound interest, annuity, notes and bank discount, mathematics of buying, markup and markdown.

#### Course Outcomes

- CO 1 Use the basic principle and methodologies of mathematics to solve the mathematical analysis problems.
- CO 2 Use scientific calculator to solve the exponential and logarithmic functions.
- CO 3 Apply the mathematical concepts and the usage of the mathematical technique in business administration and management.

#### BPC2113

Quality Management

Credit: 3

Prerequisite: None

#### Synopsis

The course will provide students with a comprehensive understanding and focuses on quality management principles, performance management and quality improvement alongside relevant tools, techniques, models and frameworks. It is suitable for undergraduates who require to develop knowledge, understanding and business management skills in the fields of quality management and process improvement.

#### Course Outcomes

- CO 1 Demonstrate a working knowledge of the principles and practice of quality management.
- CO 2 Explain the quality tools and techniques for continuous quality improvement.



CO 3 Prepare a quality implementation plans for the strategic issues in quality management.

BPC2123

Organizational Behaviour

Credit: 3

Prerequisite: BPC1143 Industrial Psychology

Synopsis

This course provides an analysis of human behavior at work place. The behavior of individual, interpersonal, team and organizational levels. The development of interpersonal competencies to allow individuals to effectively work as managers or professionals in the rapidly changing, culturally diverse and technologically integrated global climate facing modern organizations. The topics like personality, attitude, perception, leadership are covered.

Course Outcomes

- CO 1 Classify the theories of Organizational Behavior.
- CO 2 Demonstrate the issues relating of human behavior at work place and related issues.
- CO 3 Report human behavior skills for development of organization.

BUM2433

Statistics for Management

Credit: 3

Prerequisite: None

Synopsis

This course discusses descriptive statistics; graphical summary; common probability distributions; statistical analysis for means; regression and correlation including simple and multiple linear regressions, and goodness of fit test and contingency tables. Statistical packages such as Microsoft Excel, SPSS, R Language, S Plus, EViews and Minitab shall be used in this course.

Course Outcomes

- CO 1 Acquire the fundamental principle of statistics.

CO 2 Perform statistical analysis by using appropriate statistical theory and methodology.

CO 3 Analyse real life data to solve related problems in various disciplines.

BPC3123

Research Methodology

Credit: 3

Prerequisite: None

Synopsis

This course is designed to introduce students to the research methods that can be applied when conducting research projects. The topics to be covered include Introduction to research, approaches to research, problem statement, research objective, research question, literature reviews, theoretical framework and hypothesis development, research design, case study research, data collection method, measurement, sampling, data analysis, introduction to Excel/SPSS and writing the research proposal, poster and article.

Course Outcomes

- CO 1 Differentiate between qualitative and quantitative research method.
- CO 2 Construct research proposals by using appropriate research methods.
- CO 3 Propose research methods for problem solving.

BPC3123

Strategic Management

Credit: 3

Prerequisite: None

Synopsis

This course exposes students on the aspects of strategic management in a business environment. The covered areas for this course are: the nature of strategic management; external and internal assessment; strategic analysis and choice; strategy implementation; and strategic evaluation and control.

Course Outcomes

- CO 1 Analyze the strategic management concepts and techniques.
- CO 2 Demonstrate the strategic management concepts and techniques in a business environment.
- CO 3 Initiate strategy choice for implementation.

BPC3132

Final Year Project I

Credit: 2

Prerequisites: BPC3113 Research Methodology

#### Synopsis

This course will expose the students to the process of conducting academic research in order to provide the skills and ability in carrying out research projects in the area of their study. The covered areas for Final Year Project 1 are: (i) problem background, (ii) problem statement, (iii) research objectives, (iv) research questions, (v) research framework, (vi) literature reviews, and (vii) research methods.

#### Course Outcomes

- CO 1 Produce problem statement and research objective in the chosen industrial management field.
- CO 2 Manipulate the reliable sources for exceptional, detail and accurate literature review.
- CO 3 Construct noble research work by producing the feasible flow of methodology.
- CO4 Build effective skills in report writing and oral presentation- through overall report contents and oral presentation session.
- CO5 Demonstrate good attitude to fulfill research requirements.

BPC4114 (Semester 7/4)

Final Year Project 2

Credit: 4

Prerequisite: BPC3132 Final Year Project I

#### Synopsis

This course will expose the students to the process of conducting academic research in

order to provide the skills and ability in carrying out research projects in the area of their study. The covered areas for Final Year Project II are: (i) development of research instruments for data collection, (ii) carrying out data collection, (iii) analyzing data collected, (iv) interpreting data, (v) writing reports.

#### Course Outcomes

- CO 1 Produce validated research instrument.
- CO 2 Organize the research findings based on theoretical knowledge.
- CO 3 Construct the conclusion of the research and recommendation for improvement.
- CO4 Build an effective skill in report writing and oral presentation through overall report contents and oral presentation session.
- CO5 Demonstrate a good attitude to fulfill research requirements.

BPC4112

Industrial Training

Credit: 12

Prerequisites: All core faculty and core programme courses from Semester 1 to Semester 7

#### Synopsis

As part of the Faculty of Industrial Management with an integrated curriculum of the Bachelor of Project Management degree courses, all students are required to undergo industrial training for a minimum period of 24 weeks. Placement of students at various companies will be supervised and coordinated by the Industrial Training Committee set up by the Faculty. Students will be placed at various companies throughout Malaysia. The training at the various companies will expose the students to a real working environment including the companies' organization structures, business operations and technology management. The hands-on experience in the training will reinforce what has been taught at the University. The students are also required to prepare an industrial training report and do the final presentation describing the tasks they are assigned in their placement.

### Course Outcomes

- CO 1 Expose students to the "real" working environment and get acquainted with the organization structure, business operations and technology management.
- CO 2 Build effective communication skills in written and oral presentation.
- CO 3 Build hands-on experience in their related field so that students can relate to and reinforce what has been taught at the University.
- CO 4 Integrate cooperation and collaboration between industry and the university in promoting a knowledgeable society.

### CORE PROGRAMME

BPM1313  
Project Management  
Credit: 3  
Prerequisite: None

#### Synopsis

This course provides foundation and knowledge of project management. Students will be exposed to various body of knowledge and institutions related to project management in particular to Project Management Institute (PMI). Throughout the semester, students are given the well-rounded knowledge of theories, project management process and the skills required to manage a project effectively. Last but not least, students also will have the opportunity to explore various methods and approaches of project management and project management software.

### Course Outcomes

- CO 1 Explain concept of project management process according to selected body of knowledge and organizational influence towards project management success and project team's roles and organizational influence towards project management success.
- CO 2 Identify best-fit project management software for the organization.
- CO 3 Demonstrate understanding of project life-cycle management according to

different industries.

BPM2313  
Project Financial Management  
Credit: 3  
Prerequisite: None

#### Synopsis

With the recent spate of companies experiencing financial difficulties, the issue of sound financial management is now more important than ever. The course is designed to provide a basic understanding of the fundamental concepts and principles that influence investment and financing decisions of the projects at the pre-feasibility stage. It examines relevant issues including financial strategy, debt and equity management, the key drivers of shareholders value, risk and return concept in investment and capital budgeting as vehicles to evaluate investment choice.

### Course Outcomes

- CO 1 Explain basic elements of financial management that consist of financing, operating and investing activities.
- CO 2 Demonstrate basic financial calculation for further understanding about financial management analysis.
- CO 3 Discuss the use of basic financial information in the decision-making process.

BPM2323  
Project Estimating & Budgeting  
Credit: 3  
Prerequisite: None

#### Synopsis

This course examines estimating practices and techniques in managing a project cost. The focus includes breaking project costs and quantities into labour, material, plant, direct and indirect cost components. The differences in quantity-related, time-related and fixed cost are explored. Students will learn how to develop a project cost estimate, project budget and project budget baseline. A number of approaches and techniques that can be applied in managing cost effectively will be

introduced. The course will also look at more strategic estimating areas such as pricing preliminaries and determining margins for profit and overheads.

#### Course Outcomes

- CO 1 Explain the fundamental aspects of project cost estimating and budgeting.
- CO 2 Demonstrate the process of estimating in managing costs for a project.
- CO 3 Explain appropriate technique and approach in preparing project cost estimate and budget.

#### BPM2333

##### Planning & Scheduling

Credit: 3

Prerequisite: None

#### Synopsis

This course aims to expose students with knowledge and practical experience in the scheduling process during project planning. It focuses on approaches and strategies in developing viable schedules influencing project success. Selected project management tools or software are introduced during the lab sessions to grant students with necessary knowledge and skills in dealing with stages of the project life cycle, to work within organizational and cost constraints, and to manage resources effectively.

#### Course Outcomes

- CO 1 Identify the importance of planning and scheduling in ensuring project success.
- CO 2 Display the use of various scheduling tools and techniques.
- CO 3 Demonstrate appropriate techniques for resource estimation and allocation for project planning and scheduling.

#### BPM2343

##### Integrated Project Management 1

Credit: 3

Prerequisite: None

#### Synopsis

This course aims to incorporate and integrate

courses taught throughout the year of studies. Students are put in groups to complete and solve project tasks. Tasks involved include planning and scheduling from the start until completion date of the project, estimating and budgeting the cost involved, as well as finding reliable sources to finance the project. Throughout the course, students are supervised by the lecturers to guide and ensure they can complete the project as good as possible and achieve the objectives of this course. At the end of the semester, they will be required to submit their recommendation and present their work to a panel of assessors.

#### Course Outcomes

- CO 1 Develop planning and scheduling of a project.
- CO 2 Apply the principles of estimating and budgeting in a practical scenario.
- CO 3 Demonstrate knowledge and skills to operate as an individual in a team-based environment.
- CO4 Perform project tasks in a professional manner.

#### BPM2353

##### Procurement Management

Credit: 3

Prerequisite: None

#### Synopsis

This course focuses on essential understanding and knowledge of principles, concepts and techniques for effective project procurement management. The course begins with introductory sections explaining various definitions of contracts and general principles of contract law. Students will be exposed to various types of procurement systems and contracts. Then the Project Procurement Management Knowledge Area processes are presented: Plan Procurements, Conduct Procurements, Administer Procurements, and Close Procurements. The processes in Project Procurement Management are initiated early in the project with a procurement management plan and are ongoing throughout the life of the project. At the end of this course, students will be equipped with the skills and necessary knowledge in assessing conflicts and remedies for contract breach as well as

contractual implications.

#### Course Outcomes

- CO 1 Demonstrate the fundamental concepts of procurement and law of the contracts.
- CO 2 Explain the project procurement process in order to select the best procurement practice.
- CO 3 Identify the various dispute resolution methods in projects.

#### BPM2363

Integrated Project Management 2

Credit: 3

Prerequisite: BPM2343 Integrated Project Management 1

#### Synopsis

This course aims to incorporate and integrate courses taught throughout the year of studies. Students are put in groups to complete and solve project tasks. Tasks involved include planning and scheduling from the start until completion date of the project, estimating and budgeting the cost involved, as well as finding reliable sources to finance the project. Throughout the course, students are supervised by the lecturers to guide and ensure they can complete the project as good as possible and achieve the objectives of this course. At the end of the semester, they will be required to submit their recommendation and present their work to a panel of assessors.

#### Course Outcomes

- CO 1 Develop planning and scheduling of a project.
- CO 2 Apply the principles of estimating and budgeting in a practical scenario.
- CO 3 Demonstrate knowledge and skills to operate as an individual in a team-based environment.
- CO4 Perform project tasks in a professional manner.

#### BPM3313

Project Control

Credit: 3

Prerequisite: None

#### Synopsis

The purpose of this course is to give an understanding of Project Control and to provide practical guidance to enable the students to perform Project Control in the real world. Project Control is an important component of Project Management, and the success of a project relies on the ability to control the project. Project Control focuses on project scope, schedule and budget, and how to determine when the project is off-course in these areas, and how to get back on track.

#### Course Outcomes

- CO 1 Demonstrate the way project team members carry out the process of project control.
- CO 2 Display the use of various control tools and techniques.
- CO 3 Explain the close out process for projects.

#### BPM3323

Project Risk Management

Credit: 3

Prerequisite: None

#### Synopsis

This course develops students with necessary knowledge and skills in managing risks in becoming a good project manager. In this course, students will be exposed to the risk management process used by an organization during the Project Life Cycle. Students will have a firm understanding of the input, output, as well as tools during risk identification, risk analysis, risk response planning and risk control according to PMBOK (5th Edition).

#### Course Outcomes

- CO 1 Explain key project risks.
- CO 2 Categorize the impacts of risk to a project in order to finalize the best mitigation strategies to be employed.
- CO 3 Explain risk management process.

#### BPM3333

Stakeholder Management

Credit: 3

Prerequisite: None

## Synopsis

This course provides a framework for understanding and managing stakeholders for achieving successful project outcomes. The students will explore the importance of the relationships between project stakeholders as a key to project success. In addition, the course aims to provide knowledge on types of project stakeholders, effective communication techniques for managing expectations and support of stakeholders. At the end of the course, students will know how to craft appropriate communication and management strategies for developing and maintaining successful relationships with stakeholders.

## Course Outcomes

- CO 1 Explain the impact of stakeholders on project success.
- CO 2 Demonstrate appropriate communication skills at various levels involving stakeholders.
- CO 3 Integrate stakeholder's actions to project activities which may affect progress of a project.

BPM3343

Project Portfolio Management

Credit: 3

Prerequisite: None

## Synopsis

This course aims to provide a perspective in managing projects within organizations. Students will have the opportunity to obtain firm understanding on project portfolio management by improving resource utilization and planning, and making the right decision at the right time. Establishing proper methods in evaluating, selecting and prioritizing organizational resources to the projects are discussed extensively. Appropriate tools and techniques shall be practiced in class to assist students in evaluating project that are aligned with corporate strategies and return on investment goals. At the end, students are able to develop necessary skills in monitoring resource utilization, cost and projects across the portfolio.

## Course Outcomes

- CO 1 Explain the importance of Project Portfolio Management in an organisation.
- CO 2 Demonstrate the methods for project selection in an organisation.
- CO 3 Analyze the issues and challenges associated with Project Portfolio Management implementation.

## ELECTIVE COURSES

BPE3613

Construction Management (E)

Credit: 3

Prerequisite: None

## Synopsis

This course is designed to introduce students with management-oriented practice for the construction industry. It focuses on a broad range of interrelated disciplines including residential, commercial and civil construction. Topics include basic concepts of construction management, roles of professionals in construction industry, construction labour management, project team coordination, site management, material management, and professional ethics in the construction industry. On top of that, students also will be exposed to various professional bodies in the construction industry.

## Course Outcomes

- CO 1 Apply knowledge and understanding of the general practice in construction management.
- CO 2 Distinguish the project team according to their functions and apply the best management practice in the construction site.
- CO 3 Identify good ethical practice in construction management.

BPE3623

Construction Technology (E)

Credit: 3

Prerequisite: None

## Synopsis

This course focuses on the knowledge of

construction technology. The course begins with the construction work organizations and site preparations works. Then, students will be exposed with the design aspects and construction methods for buildings. It includes selected topics on substructure and superstructure works, which give fundamental concepts of the structure of a building. The topics include the construction of frames, walls, floors and roofs. It also covers the construction of stairs, doors and windows including associated glass and glazing, water supply, drainage and external works associated with a building.

#### Course Outcomes

- CO 1 Distinguish the components related to site organization and temporary works in construction of a building.
- CO 2 Illustrate the design aspects and construction methods for buildings.
- CO 3 Explain the methods of construction sequentially.

#### BPE3633

##### Construction Drawings & Measurement (E)

Credit: 3

Prerequisite: None

#### Synopsis

This course attempts at providing the students with knowledge of and understanding the basic concepts of accepted drawing conventions and format together with how to interpret architectural and engineering drawings. Students are also taught on the fundamentals principles for the measurement work items specially focus on building works. It also includes the writing of specifications for such items. The Standard Method of Measurement 2 (SMM2) will be used as guidance for the students in preparing the measurement of quantities and specification for billing.

#### Course Outcomes

- CO 1 Explain the basic concept of different types of drawing for construction projects.
- CO 2 Prepare brief specifications on the measured items effectively according to the drawings and SMM2.

- CO 3 Measure the quantities for elements in building work using basic measurement techniques according to SMM2.

#### BPE3713

##### Introduction to Software Engineering (E)

Credit: 3

Prerequisite: None

#### Synopsis

This course is an introduction to software engineering with an emphasis on the methods, techniques and technology to build and evolve software systems. The emphasis is on software engineering principles, which cover the main activities of building systems (requirements specifications, system architecture and design, system construction, and deployment and maintenance) and the elements that are integral to those activities (evolution, measurement and evaluation, teamwork, and management of project). In addition, this course will also cover process engineering and project management.

#### Course Outcomes

- CO 1 Distinguish the important terminology and activities related to foundation concepts of software engineering and software development process.
- CO 2 Apply appropriate methods for the design and implementation of software systems.
- CO 3 Explain the use of modules and interfaces to enable separate development, and design patterns.

#### BPE3723

##### Introduction to Computer Network & Security (E)

Credit: 3

Prerequisite: None

#### Synopsis

This course introduces the overview of network management systems and the five areas of network management. Student will learn a practical means of designing or evaluating a network management system for a particular networking environment. This

course also covers the principles of cyber security, as well as issues and approaches in securing systems and data from threats.

#### Course Outcomes

- CO 1 Explain the areas, design and evaluation of a network management system for a particular networking environment.
- CO 2 Display theory and principles of information security, types of attacks, cryptography, firewalls, wireless and intrusion detection system.
- CO 3 Identify major security issues and trends in the study of cybercrime and computer related security.

BPE3733

System Analysis and Design (E)

Credit: 3

Prerequisite: None

#### Synopsis

This course explores the concepts and methods of information system analysis and design, with an emphasis on system analysis methods and tools. The course focuses on the issues and management techniques involved in analysis, design and implementation of information system.

#### Course Outcomes

- CO 1 Explain the fundamentals of Information Systems (IS) development life cycle and methodologies.
- CO 2 Apply the appropriate analysis method and design tool in developing an Information System.
- CO 3 Display how project management software packages can be used to assist in representing and managing information system projects.

BPE4613

Construction Economics (E)

Credit: 3

Prerequisite: None

#### Synopsis

This course enables students to explore the

elements of economic theory and its application to the construction and petroleum industries. The topic of this course covers the introduction of micro and macroeconomics together with discussion on the nature of the construction market including the concept, definition, profit and marginal analysis, demand and supply. Besides, the focus is on the broad understanding of the project development process and parties involved and consideration of risk and uncertainty in project development. It concludes with an overview of long-term operational costs and environmental impact through the concepts of life-cycle cost planning.

#### Course Outcomes

- CO 1 Prepare various preliminary estimating and cost analysis methods.
- CO 2 Demonstrate the relationship of the construction industry to the nation's economy.
- CO 3 Demonstrate project life-cycle cost studies for construction project management.

BPE4623

Industrial Safety and Health (E)

Credit: 3

Prerequisite: None

#### Synopsis

This course introduces the principles and concepts of health and safety in the construction and petroleum industry. Students will be exposed to the history of health and safety development, the policy involved, procedure in promoting health and safety culture, hazard control and monitoring review and audit for safety. Discussions on main legal requirements for construction and petroleum industrial safety will also be discussed.

#### Course Outcomes

- CO 1 Describe the importance of safety and health in the construction and petroleum industry.
- CO 2 Demonstrate appropriate actions to be taken in health and safety issues at the workplace.
- CO 3 Study the challenges in implementing health and safety culture in an



organization.

#### BPE4633

Construction and Sustainable Development (E)

Credit: 3

Prerequisite: None

Synopsis

This course is designed to introduce the fundamental concepts of sustainability in construction and development; the environmental, economic and social components. Additionally, this course will develop basic knowledge about the environmental impacts of various phases of a construction project and the consequences of such impacts including the global warming and resource depletion issues. Topics include basic building designs and systems related to sustainability. Students learn about green design topics such as site plans, water and energy efficiency, material and resources usage, environmental quality and renewable energy source. As an outcome of the course, students are able to incorporate green technologies into building projects.

Course Outcomes

- CO 1 Explain the concepts of sustainable construction.
- CO 2 Identify the latest green design and technology for building construction and project management.
- CO 3 Verify the role of project manager according to knowledge areas in sustainable construction.

#### BPE4713

Integrated Media Application for Business (E)

Credit: 3

Prerequisite: None

Synopsis

This course introduces the basic elements or typical components of multimedia including text, graphics, sound, video and animation for education and business. Basic design principles are combined with digital image file formats and compression. The students learn to identify the software in creating digital images and videos, and locating sources of

royalty-free stock photography to enable them to create multimedia presentations. At the end of the course, the students are able to handle a project using different multimedia sources incorporating digital images and demonstrate their ideas through a proposal in a professional manner.

Course Outcomes

- CO 1 Identify the typical components of multimedia.
- CO 2 Design multimedia presentations using text, graphics, sound, video and animation.
- CO 3 Propose a project by applying different multimedia sources.

#### BPE4723

Business Analytics (E)

Credit: 3

Prerequisite: None

Synopsis

This course aims to explore business analytics techniques to formulate and solve business problems in supporting managerial decision making. It provides students with the skills required to meet the demands of industry using different tools and techniques of business analytics. The students are equipped with the knowledge and applied skills in data science, big data analytics and business intelligence.

Course Outcomes

- CO 1 Demonstrate the basic knowledge and process of business analytics and its applicability in the context of a project life cycle.
- CO 2 Display the skills to use different business analytics tools and techniques.
- CO 3 Propose a business analytical report to solve practical problems identified in managing project.

#### BPE4733

E-Business Strategy and Practice (E)

Credit: 3

Prerequisite: None

Synopsis

This course provides students with the foundations and future development of business when venturing into the new digital economy which is E-Business. It offers a complete overview of business models and e-business strategies. The course highlights theory as well as electronic markets practice in dealing with business and social networking between companies. This course examines myriad issues a business must address when venturing into e-business. The course structure is designed to enable students to transform basic companies into e-business enterprises and the digitalization of core company processes.

#### Course Outcomes

- CO 1 Describe the concept of e-business.
- CO 2 Point out the main components of E-business.
- CO 3 Integrate business models into E-business with the usage of appropriate and relevant tools





# **CENTRE FOR FOUNDATION AND PRA DIPLOMA**

**COURSE INFORMATION 2022-2023**

## CURRICULUM STRUCTURE FOR ASASI

Semester	Code	Course	Classification	Credit	Total Credit
1	UHP1013	Preparatory English	Common Core	3	15
	UHQ1012	Talent Development	Common Core	2	
	FSM1015	Fundamental Mathematics	Core	5	
	FSP1015	Mechanics Physics	Core	5	
2	UHD1013/ UHC1013	Deutsch 1 Or Mandarin 1	Common Core	3	18
	FSM1025	Essential Engineering Mathematics	Specialization	5	
	FSP1025	Electromagnetic Physics	Specialization	5	
	FSC1015	General Chemistry 1	Core	5	
3	UHD1023 /UHC1023	Deutsch 2 or Mandarin 2	Common Core	3	17
	UHK1012	Intercultural Communication	Common Core	2	
	FSD1012	Basics of Data Science	Specialization	2	
	FSC1025	General Chemistry 2	Core	5	
	FSK1015	ICT Programming and Logic Essentials	Common Core	5	
<b>Total Credit</b>					50

### PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1	Students will be able to apply basic knowledge in science, technology, engineering and mathematics.
PEO2	Students will be able to do basic practical skills to solve related problems.
PEO3	Students will be able to integrate affective values in life

### PROGRAMME LEARNING OUTCOMES (PLO)

PLO1	Utilize facts to describe and discuss concepts, principles and processes in a specific field of study.
PLO2	Apply fundamental principles in the field of study to identify and solve problems.
PLO3	Conduct academic activities such as collect, analyze, organize and process data/ information to make conclusions individually or in groups.
PLO4	Communicate effectively, orally and in writing.
PLO5	Utilize basic digital technology applications to seek and process data related to a specific field of study.
PLO6	Search, interpret and use relevant information to pursue lifelong learning independently.

## COURSE SYNOPSIS

### UHP1013

#### PREPARATORY ENGLISH

The course primarily aims to equip students with enhanced communicative performance in academic settings. They will be exposed to listening and comprehending main points and supporting details on both concrete and abstract topics, particularly related to personal or professional interest when the delivery is clear. Additionally, students will be trained to discuss, offer suggestions to support ideas and evaluate opinions on challenging yet familiar topics. They will also be taught to write clear, straightforward texts. This course is defined within the CEFR high B1 to low B2 level.

### UHQ1012

#### Talent Development

This course aims to develop students who are able to apply soft skills in terms of basic practical skills, communication, life-long learning in order to promote a positive attitude and moral values. The course is implemented through students' involvement in faculty courses including activities, practises or tasks comprising of sports and games, clubs and societies, as well as uniform body.

### UHD1013

#### Deutsch 1

This course enables the students to understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. Students can introduce themselves and others and can ask and answer questions about personal details such as where they live, people they know and things they have. The students can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.

### UHC1013

#### Mandarin 1

The course aims to enable students to speak simple Mandarin in their daily life. The

students will learn Chinese Phonetics (Hanyu Pinyin System) and about 150 vocabulary based on the Chinese Proficiency Test (Hanyu Shuiping Kaoshi HSK) Level One. Students will be exposed to simple phrases and basic sentence structures. Practices that based on HSK Level One grammar point are also introduced. Classroom activities will include listening, speaking, reading and writing. The students will be evaluated based on the four language skills. By the end of this course, students should be able to attempt the HSK Level 1 Exam or the Common European Framework of References for Languages (CEFR) A1 level.

### UHD1023

#### Deutsch 2

This course enables the students to understand simple sentences and frequently used expressions related to daily practices (e.g. very basic personal and family information, shopping, local geography, employment, travelling, festivals, clothing, and German culture). The students can communicate in simple sentences and execute routine tasks requiring a simple and direct exchange of information on familiar matters. They can describe aspects of their background, immediate environment and matters in areas of immediate need in basic terms.

### UHC1023

#### Mandarin 2

The course aims to expose students to speak Mandarin in selected situations which include asking for directions, travelling, foods and etc. The students will continue to practice the use of Chinese Phonetics (Hanyu Pinyin System). They will also learn about 300 vocabulary and are expected to use simple Chinese phrases and sentences suggested based on Chinese Proficiency Test (Hanyu Shuiping Kaoshi HSK) Level Two. Practices that are based on HSK Level Two grammar points are also introduced. Classroom activities will focus on language skills practices- listening, speaking, reading and writing. The students will be evaluated based on the four language skills. By the end of this course, students should be able to attempt the HSK Level 2 Exam or the

Common European Framework of References for Languages (CEFR) A2.

### **UHK1012**

#### **Intercultural Communication**

This course aims to develop student's communicative competence in spoken production and interaction with the purpose of improving their ability to interact with others in their personal and professional lives. The course begins with a focus on small talk topics such as day to day topics to enhance interpersonal communication and professional relationships. The course will also emphasise significant intercultural and global topics such as world politics, climate change, national policy and educational reform to build students confidence for improved intrapersonal, interpersonal and intercultural communication.

### **FSM1015**

#### **Fundamental Mathematics**

This course is designed to develop students' confidence with mathematical concepts and relationships and use of mathematics and techniques in a range of contexts specifically problem solving and abstract thinking. Topics covered are numbers, functions and polynomials, sequence and series, matrices, vector, limits and differentiation.

### **FSP1015**

#### **MECHANICS PHYSICS**

The course covers the foundations of physics in which includes topics on units and measurements; kinematics in one dimension and two dimensions; dynamics; work and energy; linear momentum; circular motion; statics and torques; periodic motion and waves; deformation of solids; heat and thermodynamics.

### **FSM1025**

#### **ESSENTIAL ENGINEERING MATHEMATICS**

This course will enable students to study the basic concepts of calculus and statistics. Topics include integrals, application of integration, differential equations, introduction to statistics and probability, random variables

and statistical distributions with a strong emphasis on engineering application.

### **FSP1025**

#### **ELECTROMAGNETIC PHYSICS**

The course covers the foundations of physics which includes topics on electric charges and forces; electric fields and potential; magnetic fields and forces; electromagnetic induction; direct current; alternating current; electromagnetic waves; geometric optics and wave optics.

### **FSC1015**

#### **GENERAL CHEMISTRY 1**

This course emphasizes basic understanding of chemistry including theories and basic concepts. The basic concepts cover atoms, atomic structure and the periodic table of elements which is often used in engineering, especially chemical and mechanical engineering. The course also focuses on the physical and chemical properties of materials. Properties of matter in gases, liquids and solids will be described. In addition, the reaction rate and the stability of matter in determining the direction the reaction will be explained. At the end of this course, students will master the theory, concepts and understandings of basic chemistry which is can be apply in engineering field.

### **FSD1012**

#### **BASICS OF DATA SCIENCE**

Data science is an emerging field of study and requires a powerful combination of various disciplines namely mathematics, statistics, computer science and domain expertise. This course presents the essentials knowledge for data science including the definition, process, applications and issues. It also introduces computer software such as Microsoft Excel or R language for: data manipulation, graphing, simple loops and function and fundamental statistics.

### **FSC1025**

#### **GENERAL CHEMISTRY 2**

This course is a continuation of the General Chemistry 1, which include the synthesis and reactions of selected functional groups in the

field of organic chemistry. Polymer will be the conclusion of all these functional groups and their application in industry.

**FSK1015  
ICT PROGRAMMING AND LOGIC  
ESSENTIALS**

This course is designed to provide essential knowledge on ICT and develop students' skill in problem solving through designing and developing computer programs. Topics covered are problem-solving techniques, introduction to structured programming, basic algorithms for searching and sorting, and the modular programming approach.







# CENTRE FOR MATHEMATICAL SCIENCES

COURSE INFORMATION 2022-2023

## CURRICULUM STRUCTURE BACHELOR OF APPLIED SCIENCE IN DATA ANALYTICS WITH HONOURS

YEAR SEM	FIRST		SECOND		THIRD		FOURTH	
	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
	UHL2400 Fundamentals Of English Language	UHL2412 English For Academic Communication	UHL2422 English For Technical Communication	UHL2432 English For Professional Academic Report Writing	UGE2002 Technopreneurship	BSD4**3 Elective I	BSD4812 Industrial Training	
	UHC1012 Falsafah & Isu Semasa	UHF1**1 Foreign Language I	UHF2**1 Foreign Language II	BSD3143 Operational Research	BSF2112 Industry Quality Management	BSD4**3 Elective III		
	UHL1022 Softskills	UGA2022 Kokurikulum	UHC2022 Penghayatan Etika & Peradaban	BSD2223 Data Science Programming II	BSD3433 Experimental Design Analysis	BSD4**3 Elective III		
	BSD1113 Discrete Mathematical Structure	BUM2123 Applied Calculus	BSD1133 Differential Equation	BSD2333 Data Wrangling	BSD3443 Statistical Modelling and Simulation	BSD3724/BSD3734 Data Science Project II		
	BSD1123 Linear Algebra	BUM2413 Applied Statistics	BSD2213 Data Science Programming I	BSD2343 Data Warehousing	BSD3523 Machine Learning			
	BSD1313 Introduction to Data Science	BSD1323 Storytelling and Data Visualization	BSD2423 Mathematical Statistics	BSD2513 Artificial Intelligence	BSD3533 Data Mining			
	BSD1412 Counting and Probability	BCI1023 Programming Techniques	BCI1093 Data Structure & Algorithm	BSD2712 Research Methodology	BSD3722 Data Science Project I			
	BCI1143 Problem Solving	BPQ1223 Principles of Operation Management	BCI2023 Database System					
<b>TOTAL CREDIT FOR GRADUATION</b>	<b>18</b>	<b>20</b>	<b>20</b>	<b>19</b>	<b>18</b>	<b>13</b>	<b>12</b>	<b>120</b>

This programme offered in 2 modes  
 \* Course Work Mode: Last semester at industry workplace  
 \* Industry Mode (Zu2i): Last two semesters block released at industry workplace

The information provided by Centre for Mathematical Sciences are based on University's Regulation and endorsement until 1 July 2022

**ELECTIVE COURSES FOR  
BACHELOR OF APPLIED SCIENCE IN DATA ANALYTICS WITH HONOURS  
(COURSE WORK MODE)**

NO.	CODE	COURSE	CREDIT HOUR
1	BSD4483	Multivariate data analysis	3
2	BSD4473	Time series analysis	3
3	BSD4553	Deep learning	3
4	BSD4713	Circular data analysis	3
5	BSD4723	Decision analysis	3
6	BSD4733	Forensic data analysis	3
7	BSD4743	Econometrics	3
8	BSD4753	Fuzzy set theory and applications	3
9	BSD4763	Geographical information system	3
10	BSD4773	Risk analysis	3
11	BSD4783	Stochastic analysis and applications	3
<b>Total minimum credits of elective courses for graduation</b>			<b>9</b>
<small>*students are compulsory to take three (3) elective courses during the study</small>			

**ELECTIVE COURSES FOR  
BACHELOR OF APPLIED SCIENCE IN DATA ANALYTICS WITH HONOURS  
(2U2I MODE)**

NO.	CODE	COURSE	CREDIT HOUR
1	BSD4453	Multivariate data analysis	3
2	BSD4463	Time series analysis	3
3	BSD4543	Deep learning	3
4	BSD4613	Circular data analysis	3
5	BSD4623	Decision analysis	3
6	BSD4633	Forensic data analysis	3
7	BSD4643	Econometrics	3
8	BSD4653	Fuzzy set theory and applications	3
9	BSD4663	Geographical information system	3
10	BSD4673	Risk analysis	3
11	BSD4683	Stochastic analysis and applications	3
<b>Total minimum credits of elective courses for graduation</b>			<b>9</b>
<small>*students are compulsory to take three (3) elective courses during the study</small>			

<b>PROGRAMME EDUCATIONAL OBJECTIVES (PEO)</b>	
PEO1	Possess competency in Data Analytics and innovative applications.
PEO2	Communicate effectively in leading and engaging multidisciplinary fields.
PEO3	Competent in research and development with potential to become data technopreneurs at global level.
<b>PROGRAMME OUTCOMES (PO)</b>	
PO1	Able to possess fundamental knowledge of Data Analytics.
PO2	Able to develop analytical and critical thinking by utilizing Data Analytics knowledge in solving various problems.
PO3	Able to design, implement and manage data resources using various Data Analytics technologies.
PO4	Able to show interpersonal and social skills.
PO5	Able to communicate ideas in appropriate forms, various mediums, and to a range of audiences in different situations effectively.
PO6	Able to take responsibility as a leader effectively.
PO7	Able to show enthusiasm, independent learning, intellectual, self-control, confident and professionalism in completing the task.
PO8	Able to develop entrepreneurial skills.
PO9	Able to show professional and ethical responsibility.

**COURSE SYNOPSIS**

BSD1113 Discrete Mathematical Structure  
Credit Hour: 3  
Prerequisite: None

**Synopsis**

This course introduces and discusses the fundamental of the discrete for computer science, which focuses on providing a basic theoretical foundation for further work. Students will be exposed to basic logic, proof techniques, set theory, functions & relations, elementary number of theory, graphs, trees and modelling finite state machine. This course integrates symbolic tools, graphical concepts, and numerical calculations for mathematical discrete structure.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Acquire fundamental principle of discrete mathematical structure.
- CO2: Analyse mathematical problems using discrete mathematical structure knowledge.
- CO3: Provide solution to discrete mathematical structure problems arise into real life data.

BSD1123 Linear Algebra  
Credit Hour: 3  
Prerequisite: None

**Synopsis**

This course covers fundamentals of matrix theory followed by some applications. The first part of this course covers introduction to vectors, solving linear equations, vector spaces and subspaces, orthogonality, determinants, eigenvalues and eigenvectors, linear transformations, complex vectors and matrices. The second part are the applications which cover applications of linear algebra in data science.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Acquire fundamental principle of linear algebra.
- CO2: Analyse mathematical problems using linear algebra knowledge.
- CO3: Provide solution to linear algebra problems arise into real life data.

BSD1313 Introduction to Data Science  
Credit Hour: 3  
Prerequisite: None

**Synopsis**

Data science is an emerging field of study and requires a powerful combination of various disciplines namely mathematics, statistics, computer science and domain expertise. This course presents the overview of data science including the definition and foundation of data science, the process of data science, its infrastructure, computing for data science and issues related to data science. Case studies are discussed to illustrate the data science application.

**Course Outcome**

By the end of semester, students should be able to:

- CO1: Explain the terminologies used in data science.
- CO2: Distinguish the components and requirements of data science.
- CO3: Communicate effectively in written and oral forms by completing the task given.

BSD1412 Counting and Probability  
Credit Hour: 2  
Prerequisite: None

**Synopsis**

This course introduces the basic concepts and rules of counting and probability as they apply to data analytics, focusing on providing a theoretical foundation for further and idealized situations drawn from everyday life

data. Students will be exposed to basic of counting, advanced counting techniques, probability theory and its relationship with counting rules, and review on random variables and probability distributions. Students will be able to determine the number of outcomes of an event and determine the possibility of an event which occurs in various fields and apply the knowledge into real life data such as in science, engineering, technology, industrial, computing, games, sports, political, business, security and history. This course integrates symbolic tools, graphical concepts, and numerical calculations of counting and probability.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of counting and probability.

CO2: Solve any related problems of counting and probability in various fields.

CO3: Apply appropriate concepts and methods of counting and probability into real life data.

#### BCI1143 Problem Solving

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course expose to the students with the appropriate computing methods in solving problem through programming approach, which consists of programming design, algorithm, pseudo code, flow chart and logic structure.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Produce the solutions for a given problems using appropriate problem solving approach.

CO2: Demonstrate logical thinking skills in problem solving.

CO3: Demonstrate team working skills

through group assignment.

#### BUM2123 Applied Calculus

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces Polar Coordinates and Vector, Vector-Valued Functions, Partial Derivatives, and Multiple Integrals. Appropriate software is used by students to implement some of these ideas in practice.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental calculus concepts of equations and vectors.

CO2: Analyse and solve wide range of problems in science and engineering by using concept of calculus.

#### BUM2413 Applied Statistics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course discusses on statistical problem-solving methodology and descriptive statistics; sampling distribution and confidence interval; hypothesis testing; analysis of variance (ANOVA); goodness-of fit test and contingency tables; regression and correlation including simple and multiple linear regressions. Microsoft Excel software will be used in this course as a statistical package (other statistical packages are SPSS, R Language, S Plus, EViews and Minitab shall be used in this course).

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of statistics.

CO2: Perform statistical analysis by using appropriate statistical theory and

methodology.

CO3: Analyse real life data to solve related problems in various disciplines.

BSD1323 Storytelling and Data Visualization

Credit Hour: 3

Prerequisite: None

### Synopsis

Data visualization is increasingly important and useful to complement data analytics in order to communicate the findings, especially to the non-technical audience. Creating an effective storytelling through the correct data visualization skill is vital in making sure the information presented is clear and easy to understand. In this course, various aspects of data visualization from simple to complex tables, graphs and charts are demonstrated using Microsoft Excel, Tableau or Power BI. By the end of this course, student will be able to generate powerful data visualization reports, dashboards, and stories that will help people make decisions and take action based on real world data. Students will learn how to create high-impact visualizations of common data analyses to help them see, understand and effectively tell a story about the data.

### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental skill of data visualization.

CO2: Demonstrate the data visualization skill using an effective storytelling.

CO3: Display a powerful data visualization, report, dashboard or stories in solving various applications using appropriate software.

CO4: Work collaboratively as part of a team to solve given problem through group discussion and presentation.

CO5: Demonstrate an active communication through group discussion and presentation.

BCI1023 Programming Techniques

Credit Hour: 3

Prerequisite: None

### Synopsis

This course discusses on understanding problems and translating them into computer solution techniques using programming language such as C. This course enables students to apply programming techniques, write programming codes from given problems and execute programming codes successfully.

### Course Outcome

By the end of semester, students should be able to:

CO1: Demonstrate various techniques in solving a problem.

CO2: Construct and run programs.

CO3: Differentiate various techniques in solving a problem.

BPQ1223 Principles of Operation Management

Credit Hour: 3

Prerequisite: None

### Synopsis

The course provides a range of academic knowledge, operations understanding, operational management techniques. It will focus on the main decision areas of operations management and their impact on business functions and the role of the operations manager and the relationship with productivity improvement.

### Course Outcome

By the end of semester, students should be able to:

CO1: Apply the fundamental concept and the main areas of operation management.

CO2: Demonstrate operation decisions in solving operational problems.

CO3: Justify operations management requirements.

BSD1133 Differential Equations

Credit Hour: 3



Prerequisite: None

### Synopsis

This course comprises selected topics in Ordinary Differential Equations (ODE) and Partial Differential Equations (PDE) that will be used in Data Analytics program. This course starts with the first-order and second order ordinary differential equations, Laplace transform and Fourier Series. The second part of the course discuss PDE topics which are first-order and second order partial differential equations. The knowledge gained in this course is very important to assist student in other statistical/mathematical subjects. Appropriate software is used by students to implement some of these ideas in practice.

### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of first and second order differential equations, Laplace transforms and Fourier series.

CO2: Solve various first and second order ordinary differential equations, Laplace transforms and Fourier series for various periodic functions.

CO3: Solve various first and second order partial differential equations and Laplace's equation.

BSD2213 Data Science Programming I

Credit Hour: 3

Prerequisite: None

### Synopsis

Programming skill is vital to solve practical problems in various disciplines such as in science, engineering, technology and industries. This course introduces programming concepts and language construction using Python software. Students will learn about variable, loop and branching, functions, solving equations using sympy, numerical computation using numpy, graph visualization using matplotlib and data

preparation using pandas. Case studies in selected disciplines are presented to provide a motivating experience to student. At the end of this course, students will be able to develop a friendly graphical-user interface using Python programming.

### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental knowledge on basic functions of programming language.

CO2: Use appropriate Python programming technique to solve problem.

CO3: Construct programming codes and run program.

CO4: Work collaboratively to solve assigned task.

CO5: Demonstrate innovative ideas in developing a graphical user interface.

BSD2423 Mathematical Statistics

Credit Hour: 3

Prerequisite: BSD1412, BUM2413

### Synopsis

This course primarily focuses on the mathematical foundation of statistical theory in data analytics. Students will experience multiple activities designed to help them master the core concepts of mathematical statistics and prepare them with a solid foundation for the other data analytics courses. Students will be exposed to discrete and continuous random variables and their probability distributions, bivariate random variables, functions of random variables, and sampling distributions and estimation theories. This course provides an indication of the relevance and importance of the statistical theory in solving practical problems in various disciplines such as in science, engineering, technology and industries. The applications of the statistical theory may provide a refreshing and motivating experience for students.

### Course Outcome

By the end of semester, students should be

able to:

CO1: Acquire mathematical foundation concepts of statistical theory.

CO2: Apply mathematical statistics theory and methodology to the related problems of real life data in various disciplines.

CO3: Analyse statistical data by using appropriate mathematical statistics theory and methodology.

### BCI1093 Data Structure & Algorithms

Credit Hour: 3

Prerequisite: BCI1023

#### Synopsis

This course is designed to expose the students to the data structures and algorithm. It provides theoretical basis in data structures and the application of data structures is based on standard algorithms. Students must also be able to transform the data structure and algorithms problems into the computer programs.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Analyse various types of data structures and algorithms techniques in solving a related problem.

CO2: Construct a programme by applying the data structure and algorithms techniques for a related problem.

CO3: Use online application to find solution for a related problem.

### BCI2023 Database System

Credit Hour: 3

Prerequisite: None

#### Synopsis

The course emphasizes on the importance of data to an organization and how the data should be managed. Database management system (DBMS) will be viewed as a solution to the problems of file processing system. Aspects of relational database design will be covered in details. This includes database

development life cycle, database architecture, data models, and normalization process. Several query languages such as relational algebra, Structured Query Language (SQL) and Query by Example (QBE) will be discussed but the emphasis is on SQL. Students will be given a real life problem to design and develop a database application system. In the later part of the course students will be exposed to the latest developments in database architecture. uncertainty will be addressed.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Distinguish appropriate concepts, principles and applications of database systems.

CO2: Manipulate queries using the syntax of Structure Query Language (SQL), Relational Algebra and Query By Example.

CO3: Construct innovative solution through the representation of data model using ER and EER Diagrams and normalize database to be implemented in database application system using appropriate DBMS.

CO4: Work in group in order to complete the given assessments in specific time frame.

### BSD2223 Data Science Programming II

Credit Hour: 3

Prerequisite: None

#### Synopsis

Programming skills is required in data related study. This course presents basic R programming language which are widely used and open-source based. The course discusses fundamental feature of R, data exploration and data presentation tools. Students will be able to identify appropriate tools to write codes, manipulate, analyse and present their own analysis using R. This is a hands-on project-based course to enable students to develop programming and critical thinking skills. The students should be able to extend these basic knowledge and skills

using R for advanced application in data science.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental knowledge on basic functions of programming language.

CO2: Analyse and summarise data using appropriate programming tools.

CO3: Develop programming codes to solve problems.

CO4: Demonstrate verbal and written communication skills.

CO5: Relate entrepreneur skills in assigned task.

#### BSD2333 Data Wrangling

Credit Hour: 3

Prerequisite: None

#### Synopsis

Data wrangling is the process of cleaning, structuring and enriching complex raw data into a desired format for analysis and better decision making. This course introduces the knowledge and skills to wrangle data from diverse sources and shape it to enable data-driven applications. In this course, some main topics are covered including introduction of data wrangling, data cleaning and transformation, web scraping and crawling. Students will learn how to gather and extract data from widely used data formats based on the data wrangling process. Python will be used for implementation.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire data wrangling fundamental concepts and knowledge.

CO2: Apply data wrangling techniques to handle heterogeneous and distributed data.

CO3: Manipulate data to required format and location for data-driven applications.

CO4: Develop leadership skill in grouping assessment.

#### BSD2343 Data Warehousing

Credit Hour: 3

Prerequisite: None

#### Synopsis

The recent rapid growth of various open source and proprietary big data technologies allows deep exploration of these vast amounts of data. However, many of them are limited in terms of their statistical and data analytics capabilities. The main goal of the course is to navigate through the complex layers of Big Data and data warehousing, while providing information on how to effectively think about using all these technologies and the architectures to design the next-generation data warehouse. Throughout the contents of this course, the students will be exposed to core technologies that have evolved to solve large-scale data processing, including Hadoop and its ecosystem, NoSQL databases, and other technologies. In addition, students also will experience various cases on how real world companies have benefited from Big Data and data warehousing.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental Big data and data warehousing concepts.

CO2: Analyse real life problems using appropriate Big data and data warehousing concepts.

CO3: Build and integrate Big data in data warehouse by using appropriate software.

CO4: Work in group in order to complete the given assessments in specific time frame.

#### BSD2513 Artificial Intelligence

Credit Hour: 3

Prerequisite: None

## Synopsis

Artificial Intelligence (AI) is the field which focuses on the creation of intelligence in machines which able to mimic human's intelligence. This course aims to introduce students to the theory and practice of the AI. In this course, student will learn the introduction to artificial intelligence, search algorithms, knowledge representation system, natural language processing, image recognition, fuzzy logic and some real applications of artificial intelligence. Students will utilise personal and technical skills to develop artificial intelligence system in various applications including robotics and automation, intelligent manufacturing and information technology, with the assistance of computer software such as Python.

## Course Outcome

By the end of semester, students should be able to:

CO1: Acquire artificial intelligence concepts and methodologies in data science.

CO2: Demonstrate critical thinking ideas of artificial intelligence knowledge in problem-solving situation.

CO3: Develop an artificial intelligence system prototype using appropriate software.

CO4: Demonstrate verbal and written communication skills.

CO5: Integrate artificial intelligence knowledge to the project and future problems.

## BSD3143 Operational Research

Credit Hour: 3

Prerequisite: BSD1123

## Synopsis

Operational research is the fundamental knowledge and skill set which can be used to determine the best solution for real world industrial problems via mathematical modelling. This course aims to expose students to the concept and methods of optimization using data, and the required

tools to solve various applications in industry. In this course, students will be trained to use powerful optimization techniques which includes linear programming, simplex method and sensitivity analysis, transportation and assignment model, network models, integer programming and queuing models. This course utilizes both students' personal and technical skills to make the best decision which is applicable in various industry settings i.e. manufacturing, service industry, transportation, marketing, finance, medicine, law, military and public policy, with the assistance of various computer modelling solver of TORA.

## Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of operational research.

CO2: Provide solution to industrial problems using operational research methods.

CO3: Work collaboratively as part of a team to solve given problem through group discussion and presentation.

## BSD2712 Research Methodology

Credit Hour: 2

Prerequisite: None

## Synopsis

This course will provide students to establish their understanding of research through a critical exploration of research terminology, ethics, and approaches. The course introduces the terminology of research, ethical principles and challenges, and the elements of the research process within quantitative, qualitative, and mixed methods approaches. Students will use these theoretical underpinnings to begin to critically review literature which relevant to their field or interests of research, and determine how research findings are useful in forming their understanding of their work, social, local and global environment. In this course, we will introduce students possible

writing and reference softwares such as LaTeX and Mendeley.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire knowledge of research terminology, research process, quantitative, qualitative and mixed methods approaches to research.

CO2: Organise the research proposal by including the research elements accordingly.

CO3: Explain effectively in written and oral form through project proposal presentation.

CO4: Demonstrate of the ethical principles of research, ethical challenges and approval processes in proposal report and presentation.

#### BSF2112 Industry Quality Management

Credit Hour: 2

Prerequisite: None

#### Synopsis

This course focuses on the management of quality for manufacturing, service and public sectors to achieve global competitiveness. Emphasis is placed on new techniques for managing quality. This course is divided by two parts. Part one provides an introduction to quality assurance principles, including (i) Good Manufacturing Practices (GMP), (ii) ISO 9000 family and (iii) various continuous improvement techniques such as six sigma, lean manufacturing, 5S and total quality management and (iv) audit process. Part two focuses on the quality control system, which is concerned with (i) quality control tools used in industries, (ii) acceptance sampling, (iii) statistical data analysis, (iv) reliability and maintainability, and (v) cost of quality. Lectures will be conducted two hours per week; with one assignment throughout the semester. Learners are required to sit for one test, and series of quizzes to ensure sufficient fundamental knowledge. Upon completion of the course, the learners should be able to (i) hypothesize alternative approaches to solve problems related to

industrial quality management systems, and (ii) gather information from multiple sources related to quality assurance and quality control in industries.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describe the basic concept of quality assurance (QA) and quality control (QC) in industries.

CO2: Analyse suitable approach to solve problems related to industrial quality management.

CO3: Gather information from multiple sources related to quality assurance and quality control in industries.

#### BSD3433 Experimental Design Analysis

Credit Hour: 3

Prerequisite: BUM2413

#### Synopsis

This course will give students an exposure to various experimental design methods. The course emphasized students working with data and understanding the different methods of designing and analysing of the data. Students are exposed to experimental design, including basic principles and guidelines to design experiments, experiments with single factor, Randomized Blocks, Latin Squares and Related Designs, Factorial Design, and the  $2^k$  Factorial Design. The methods are developed and applied to various data sets from many different fields. Appropriate software such as Microsoft Excel or R language is used to implement Experimental Design Analysis in practice. Students will experience the theoretical and practical aspects of experimental design.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of experimental design analysis.

CO2: Design the experiment using basic

experimental design analysis for various data sets from many different fields.

CO3: Construct a powerful data analysis by using an appropriate software tools.

CO4: Demonstrate innovative ideas in experimental design analysis.

#### BSD3433 Statistical Modelling & Simulation

Credit Hour: 3

Prerequisite: BSD2423

#### Synopsis

The course focuses on methods to model and analyse a variety of random phenomena. The analysis will in practice often be done by simulation, but also the theoretical analysis is important. Students shall be able to implement statistical models on a computer, generate, interpret and present results. Topics that are appropriate to address: the general statistical model building, assessing the goodness of the model, estimation of distribution and parameters of the model and assess the uncertainty of estimates, bootstrap, number generators, variance reduction techniques, modeling and simulation of dependencies. The R statistical package will be used throughout the course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Apply various approaches and knowledge of statistical modelling.

CO2: Formulate statistical models for various problems in science, engineering and industry.

CO3: Manipulate statistical modelling theory and methodology in solving various applications using appropriate statistical software.

CO4: Demonstrate good interest and initiative for exploring issues in statistical modelling analysis for a given task.

CO5: Plan a business strategy by generating new ideas and innovation in the application of statistical modelling and simulation.

#### BSD3523 Machine Learning

Credit Hour: 3

Prerequisite: None

#### Synopsis

Machine learning is a subfield of data science that focuses on designing algorithms that can learn from data and make predictions on it. This course provides an introduction to machine learning which includes the basic components of building and applying prediction functions with the emphasis on practical applications. Students will be provided with basic concepts such as training and tests sets, overfitting, and error rates. Range of models based and algorithmic machine learning methods are covered including regression, classification trees, Naive Bayes, random forests and so forth. In addition, the course will cover the complete process of building prediction functions including data collection, feature creation, algorithms, and evaluation. Weka/ Python/ SAS Enterprise Miner/ Knime software shall be used by students to implement these ideas in practice.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire the machine learning knowledges and processes in data science.

CO2: Evaluate the machine learning model/pipeline in solving real world problems. CO3: Construct the programming codes or workflows using appropriate machine learning tools.

CO4: Develop leadership skill in grouping assessment.

CO5: Integrate machine learning knowledges to the project and future problems.

#### BSD3533 Data Mining

Credit Hour: 3

Prerequisite: None

## Synopsis

Data mining is the process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems. This course introduces basic concepts, tasks, methods, techniques, model building and testing, and interpreting and validating results in data mining. The predictive analytics methods are applied to various data sets from many different fields. At the end of the lecture, students will create their own programming codes/ predictive workflow models in order to solve real world problems for their project. The students experience the theoretical and practical aspects of data mining knowledge in lecture and laboratory session. Python/ R/ Knime/ RapidMiner or related software is used by students to implement these ideas in practice.

## Course Outcome

By the end of semester, students should be able to:

CO1: Acquire the data mining concepts and methodologies in data science.

CO2: Design data mining models/prototypes and demonstrate critical thinking ideas in data mining knowledge and problem-solving.

CO3: Construct the programming codes or workflows using appropriate analytics tools.

CO4: Demonstrate verbal and written communication skills.

CO5: Integrate data mining knowledges to the project and future problems.

BSD3722 Data Science Project I

Credit Hour: 2

Prerequisite: None

## Synopsis

The Data Science Project must be a data driven research project which is proposed by an industrial partner and involves Data Science and Analytics cycle or skills. Learning activities are focused on developing workable research project

proposal comprising identification of (i) introduction which included research background, problem statement, research questions, research objective, research scope and significance of study, (ii) literature reviews, (iii) methodology and (iv) expected outcome and conclusions. Each student is assigned to a Academic Tutor (lecturer) and Industry Coach (industry); based on the project proposed by the industries. The stated focus are planned to be delivered by direct active/engaged learning with the advisor (weekly basis); to understand the project direction. Students are also required to gather information through reading of recently-published articles on related field. Identification of data and suitable characterization tools to ensure completion of project will be finalised and justified with guidance of Academic Tutor. A problem-based project is designed to encourage the students to incorporate managerial skills (e.g., project management, ethics, time management and log book keeping). Students are assessed based on written project proposal and efficiency of communications of project strategies during oral presentation. Students will continue laboratory work upon approval of project proposal by faculty members. Students should be able to choose appropriate data science tools and techniques and suggest suitable solutions to be applied for their Data Science Project upon completion of the course.

## Course Outcome

By the end of semester, students should be able to:

CO1: Analyse various problems by using appropriate principles of data science and analytic.

CO2: Organise data using various data science and analytic technologies.

CO3: Demonstrate effective communication skills.

CO4: Practice independent learning, good enthusiasm and professionalism in completing the task.

CO5: Present an innovative idea completely in clear, cohesive and organized manner.

**BSD3724 Data Science Project II**

Credit Hour: 4

Prerequisite: None

**Synopsis**

The Data Science Project must be a data driven research project which is proposed by an industrial partner and involves Data Science and Analytics cycle or skills. This course is a continuation of BSD3722 Data Science Project I. Learning activities are directed on completion of individual project (by Academic Tutor monitoring) including preparation and presentation. The project objectives are planned to be delivered by active/engaged learning with Academic Tutor and Industry Coach, practical laboratory work, self-reading and draft preparation. Each student is assigned to a Academic Tutor (lecturer) and Industry Coach (industry); based on the project proposed by the industries. Students will be handling data analysis and discussion prior project writing. Each student is expected to submit a fully developed and presentable project that reflects the student's command of the project process, appropriate tools usage and applications involved.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Recommend solution to solve industrial problems by applying appropriate data science and analytics methodologies

CO2: Assemble and display the data analytically using various data science and analytics technologies.

CO3: Justify project ideas effectively through written and verbal communications.

CO4: Practice independent learning, good enthusiasm and professionalism in completing the task.

CO5: Display an innovative idea completely in clear, cohesive and organized manner.

**BSD4453 Multivariate Data Analysis**

Credit Hour: 3

Prerequisite: None

**Synopsis**

The problem arise in physical phenomena are widely involve multivariate data analysis since multivariate data analysis is a central tool whenever many variables need to be considered at the same time. It is the extension of common univariate statistical procedures to analogous multivariate techniques that involve several dependent variables. Hence, this course is designed to strengthen the fundamental knowledge of multivariate data analysis which lead to understanding to the real problem in life. This course builds on knowledge of introductory to the theoretical and practical techniques in multivariate analysis. The theoretical links between multivariate techniques and corresponding univariate techniques, where appropriate is highlighted. Also, selected multivariate techniques such as multivariate analysis of variance, multivariate regression, principal components analysis, exploratory factor analysis, discrimination and classification and cluster analysis are introduced. The course also covers relevant multivariate methods in R Programming.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Acquire fundamental knowledge of multivariate data analysis.

CO2: Analyse multivariate data using the appropriate assumptions and statistical methods.

CO3: Manipulate multivariate statistical methods in solving various applications and carry out analysis by using appropriate statistical software.

CO4: Work collaboratively in groups to analyse multivariate data and document the results.

CO5: Organise various approaches to use the information and other related skills in solving any related problems.

**BSD4463 Time Series Analysis**

Credit Hour: 3



Prerequisite: None

#### Synopsis

This course will expose students to time series modelling and forecasting. The course is designed to provide students to learn time series modelling in theory and practice with emphasis on practical aspects of time series. The topics include theory and applications of linear time series for univariate data in statistics, economics and finance, science, engineering and quantitative social science. Two approaches of time series analysis are discussed here that are Box-Jenkins and exponential smoothing model. Time series models play an important role in analysing the variability inherent in data science. Appropriate software such as Python or R shall be used by students to implement time series analysis.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Describes different types and patterns of time series data and model time series.

CO2: Develop the BoxJenkins model, regression model and exponential smoothing for trend and seasonality time series.

CO3: Analyse time series data by using an appropriate software tools.

CO4: Work collaboratively in groups to analyse real time series data and document the results.

CO5: Demonstrate good interest and initiative to explore time series analysis in real world applications.

#### BSD4543 Deep Learning

Credit Hour: 3

Prerequisite: BSD3523

#### Synopsis

Deep Learning is a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks. This course

introduces student to the theory and practice of the deep learning. Students experience to the main deep learning topics including the fundamental issues, terminology, techniques, mathematics of deep learning, fundamental neural network architectures, feedforward networks, convolutional networks and recurrent networks. Practical examples of how to appropriately build and train these models and to use per-trained models for the best results will be covered. Python software will be used by students to implement these ideas in practice.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire the deep learning concepts and methodologies in data science.

CO2: Justify critical thinking ideas of deep learning knowledge in problem-solving situation.

CO3: Conduct appropriate tools to solve deep learning problems.

CO4: Demonstrate an active communication skill through group discussion and presentation.

CO5: Integrate deep learning knowledges to the project and future problems.

#### BSD4613 Circular Data Analysis

Credit Hour: 3

Prerequisite: BUM2413

#### Synopsis

Circular statistics is a branch of statistics that involve circular data which deal with direction or cyclic time. This course introduces the basic theory, methodology and applications of circular statistics as they apply to circular data through real life examples. The applications of circular statistics can be found in various areas such as in biology, physics, geology, environmental, psychology, astronomy, meteorology and medical. Over the course, students will experience multiple activities designed to help them master these core concepts and apply the theory in solving practical problems

in the real world. Students will be exposed to circular data focusing on the circular data characteristics, graphical and descriptive summaries, common circular probability distribution functions and circular models, parameter estimation, hypothesis testing, data generation, goodness of fit test, and circular correlation and regression. Appropriate software such as R shall be used in this course to implement these ideas in practice.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Acquire fundamental knowledge of circular data analysis.
- CO2: Produce statistical analysis for circular data by using appropriate statistical theory and techniques.
- CO3: Manipulate circular statistics theory and techniques in solving various applications using appropriate statistical software.
- CO4: Work collaboratively as part of a team to solve given problem through group discussion and presentation.
- CO5: Demonstrate good interest and initiative for exploring issues in circular data analysis for a given task.

#### BSD4623 Decision Analysis

Credit Hour: 3

Prerequisite: None

#### Synopsis

Decision analysis is a systemic fundamental knowledge which is needed to justify a complex decision which usually involves many uncertainty, conflicting objectives and risks. This course aims to expose students to the knowledge and methods of decision analysis and tools to solve various decision-making situations in industry. In this course, student will learn the essence of decision making process which includes introduction to decision theory, decision under uncertainty, decision under risk and multi attribute decision making. This course catalyses both personal skill and technical

skill in analysing the best decision which is applicable in various industry settings with the assistance of various conceptual tools and models for decision making support.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Use fundamental principle of decision analysis.
- CO2: Analyse mathematical problems using decision analysis methods.
- CO3: Construct solution to industrial problems using decision analysis tools.
- CO4: Demonstrate an active communication skill through group discussion and presentation.
- CO5: Initiate the exploration of issues in decision analysis for a given task.

#### BSD4633 Forensic Data Analysis

Credit Hour: 3

Prerequisite: BSD2423

#### Synopsis

Forensic scientists and statisticians are faced with the task of producing, processing, and presenting correct data that can aid legal decision-makers in recreating previous occurrences. The legal system's simultaneous issue is to strike an ideal balance between quantitative testimony's completeness and comprehensibility. This course introduces the tools of contemporary Bayesian decision theory, demonstrates their use in forensic science using paradigmatic data, and defends the techniques against different challenges. The course covers principles of probability, likelihood, and utility theory before applying them to recurrent statistical issues such as estimation, classification, and choice using Bayes' rule and loss functions.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Acquire knowledge on the process of forensic data analysis.

CO2: Analyse forensic data by using statistical estimation, classify and decide.

CO3: Manipulate the forensic data problems that arise into real-life data using appropriate statistical software.

CO4: Demonstrate verbal communication skills.

CO5: Demonstrate good interest and initiative for exploring issues in forensic data analysis for a given task.

#### BSD4643 Econometrics

Credit Hour: 3

Prerequisite: BUM2413

#### Synopsis

This course provides an introduction to the economics sciences discipline and deals with the analysis of mathematical and statistical data for testing and experimenting with economic theory. Statistical research and quantitative analysis are used to clarify and develop principles of economics. The econometrics methods such as simple linear regression model, multiple linear regression model, violation of basic regression assumptions and logistic regression model will be discussed in this course. The aim is to equip graduate students with the econometric methods in the area of economics, business, finance, marketing, management and other disciplines. This course also designed to train students in practical aspects of empirical economics using appropriate software.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire the basic principles of econometric modelling and analysis.

CO2: Analyse various economic data by using appropriate econometric modelling and methods.

CO3: Adapt appropriate software to analyse the economic data of the various application.

CO4: Work collaboratively in groups to analyse real econometric data and

document the results.

CO5: Demonstrate good interest and initiative for exploring issues in econometrics for a given task.

#### BSD4653 Fuzzy Set Theory and Applications

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course will provide the fundamental idea to provide basic and concrete concepts of the fuzzy theory and its applications, and thus on easy illustrations of the basic concepts. It consists of two parts: a theory part and an application part. The first part (theory part) includes introduce basic concepts of fuzzy sets and operations, multi-dimensional fuzzy sets, extensions of the fuzzy theory to the number and function, developments of fuzzy properties on the probability and logic theories. The second part (application part) focusing on application of fuzzy set theory in computerised tasks using appropriate softwares such as Matlab, Microsoft Excel or Python.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Use the fundamental principle of fuzzy set theory.

CO2: Justify critical thinking ideas of fuzzy set theory knowledge in problem-solving situation.

CO3: Conduct appropriate tools to solve uncertain event.

CO4: Demonstrate an active communication skill through group discussion and presentation.

CO5: Initiate fuzzy knowledge to the project and future problems.

#### BSD4663 Geographical Information System

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course is designed to introduce the student to the basic principles and techniques of GIS (Geographic Information Systems). GIS is a computer-based tool that uses spatial (geographic) data to analyse and solve real-world problems. The lab material will emphasises GIS data collection, entry, storage, analysis, and output using ArcGIS. The students will be able to describe what geography and GIS are; will understand the importance of scale, projection, and coordinate systems in GIS; will understand vector and raster data structures and the appropriate use of each of these data structures; will understand the basics of data capture, storage, analysis, and output in a GIS; and will understand typical uses of GIS in business, government, and resource management.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Acquire basic concepts and principles of GIS.
- CO2: Apply and analyse spatial data of GIS.
- CO3: Conduct appropriate tools to solve GIS problems.
- CO4: Demonstrate an active communication skill through group discussion and presentation.
- CO5: Demonstrate good interest and initiative for exploring issues in GIS for a given task.

#### BSD4673 Risk Analysis

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course is an introduction to risk management in several fields, including engineering risk analysis, environmental risk analysis, and security risk analysis. It is also identifying and structuring risk problems, probability and statistics for risk analysis, analytic approaches to risk analysis, risk consequences modelling, and application of

risk analysis and pitfalls of risk analysis. Many examples will come from real life data. Appropriate software such as R shall be used in this course to implement these ideas in practice.

#### Course Outcome

By the end of semester, students should be able to:

- CO1: Analyse knowledge of the basic concepts of risk analysis including probability theory and modeling.
- CO2: Decide the analytics approaches to analyse the real risk issues/problem.
- CO3: Apply appropriate software tools such as R to help the implementation of risk analysis.
- CO4: Work collaboratively in groups to analyse risk analysis problem and document the results.
- CO5: Organise various approaches to use the information and other related skills in solving any related problems.

#### BSD4683 Stochastic Analysis and Applications

Credit Hour: 3

Prerequisite: None

#### Synopsis

Stochastic analysis is a new way of reasoning which has wide application in all fields of science and engineering. Different from the traditional deterministic approach, stochastic analyses try to obtain useful information from seemingly random data, and stochastic models try to develop insights into the nature of randomness. The stochastic mathematics is particularly relevant to statistical physics, biology and life science, nanotechnology, signal processing and communications, and many branches of science and engineering, as well as economics and finance. The course will be taught from an application standpoint with examples from many different fields. Appropriate software such as Python shall be used in this course to implement these ideas in practice.

### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire principle of stochastic process.

CO2: Analyse mathematical problems using stochastic process knowledge.

CO3: Provide solution to stochastic problems arise into real life data.

CO4: Work collaboratively in groups to analyse stochastic problems and document the results.

CO5: Demonstrate good interest and initiative for exploring issues in stochastic analysis for a given task.

### BSD3734 Data Science Project II

Credit Hour: 4

Prerequisite: None

#### Synopsis

The Data Science Project must be a data-driven research project that is proposed by supervisor, addresses an industry problem artificially, and utilises the Data Science and Analytics cycle or skills. This is the second part of the BSD3722 Data Science Project I. Learning activities are focused on the completion of an individual project (under the supervision of a supervisor), which includes preparation and presentation. The project objectives are planned to be delivered by active/engaged learning with supervisor, practical laboratory work, self-reading, and draft preparation. Each student is assigned to a supervisor based on the project approved by the supervisor. Students will be handling data analysis and discussion prior to project writing. Each student is expected to submit a fully developed and presentable project that reflects the student's command of the project process, appropriate tools usage, and applications involved.

### Course Outcome

By the end of semester, students should be able to:

CO1: Recommend solution to solve

industrial problems by applying appropriate data science and analytics methodologies

CO2: Assemble and display the data analytically using various data science and analytics technologies.

CO3: Justify project ideas effectively through written and verbal communications.

CO4: Practice independent learning, good enthusiasm and professionalism in completing the task.

CO5: Display an innovative idea completely in clear, cohesive and organized manner.

### BSD4483 Multivariate Data Analysis

Credit Hour: 3

Prerequisite: None

#### Synopsis

The problem arise in physical phenomena are widely involve multivariate data analysis since multivariate data analysis is a central tool whenever many variables need to be considered at the same time. It is the extension of common univariate statistical procedures to analogous multivariate techniques that involve several dependent variables. Hence, this course is designed to strengthen the fundamental knowledge of multivariate data analysis which lead to understanding to the real problem in life. This course builds on knowledge of introductory to the theoretical and practical techniques in multivariate analysis. The theoretical links between multivariate techniques and corresponding univariate techniques, where appropriate is highlighted. Also, selected multivariate techniques such as multivariate analysis of variance, multivariate regression, principal components analysis, exploratory factor analysis, discrimination and classification, cluster analysis, canonical correlation analysis and structural equation modeling are introduced. The course also covers relevant multivariate methods in R Programming.

### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental knowledge of multivariate data analysis.

CO2: Analyse multivariate data using the appropriate assumptions and statistical methods.

CO3: Manipulate multivariate statistical methods in solving various applications and carry out analysis by using appropriate statistical software.

CO4: Work collaboratively in groups to analyse multivariate data and document the results.

CO5: Organise various approaches to use the information and other related skills in solving any related problems.

#### BSD4473 Time Series Analysis

Credit Hour: 3

Prerequisite: None

##### Synopsis

This course will expose students to time series modelling and forecasting. The course is designed to provide students to learn time series modelling in theory and practice with emphasis on practical aspects of time series. The topics include theory and applications of linear time series for univariate data in statistics, economics and finance, science, engineering and quantitative social science. Three approaches of time series analysis are discussed here that are Box-Jenkins and exponential smoothing model and regression with time series data. Time series models play an important role in analysing the variability inherent in data science. Appropriate software such as Python shall be used by students to implement time series analysis.

##### Course Outcome

By the end of semester, students should be able to:

CO1: Describes different types and patterns of time series data and model time series.

CO2: Develop the BoxJenkins model, regression model and exponential smoothing for trend and seasonality time series.

CO3: Analyse time series data by using an

appropriate software tools.

CO4: Work collaboratively in groups to analyse real time series data and document the results.

CO5: Demonstrate good interest and initiative to explore time series analysis in real world applications.

#### BSD4553 Deep Learning

Credit Hour: 3

Prerequisite: BSD3523

##### Synopsis

Deep Learning is a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks. This course introduces student to the theory and practice of the deep learning. Students experience to the main deep learning topics including the fundamental issues, terminology, techniques, mathematics of deep learning, fundamental neural network architectures, feedforward networks, convolutional networks and recurrent networks. Practical examples of how to appropriately build and train these models and to use per-trained models for the best results will be covered. Python software will be used by students to implement these ideas in practice.

##### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire the deep learning concepts and methodologies in data science.

CO2: Justify critical thinking ideas of deep learning knowledge in problem-solving situation.

CO3: Conduct appropriate tools to solve deep learning problems.

CO4: Demonstrate an active communication skill through group discussion and presentation.

CO5: Integrate deep learning knowledges to the project and future problems.

#### BSD4713 Circular Data Analysis

Credit Hour: 3

Prerequisite: BUM2413

### Synopsis

Circular statistics is a branch of statistics that involve circular data which deal with direction or cyclic time. This course introduces the basic theory, methodology and applications of circular statistics as they apply to circular data through real life examples. The applications of circular statistics can be found in various areas such as in biology, physics, geology, environmental, psychology, astronomy, meteorology and medical. Over the course, students will experience multiple activities designed to help them master these core concepts and apply the theory in solving practical problems in the real world. Students will be exposed to circular data focusing on the circular data characteristics, graphical and descriptive summaries, common circular probability distribution functions and circular models, parameter estimation, hypothesis testing, data generation, goodness of fit test, circular correlation and regression, and modern methodologies in circular statistics. The modern methodologies include methods to deal with outliers and missing values in circular data, robust method, and bootstrap method. Appropriate software such as R shall be used in this course to implement these ideas in practice.

### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental knowledge of circular data analysis.

CO2: Produce statistical analysis for circular data by using appropriate statistical theory and techniques.

CO3: Manipulate circular statistics theory and techniques in solving various applications using appropriate statistical software.

CO4: Work collaboratively as part of a team to solve given problem through group discussion and presentation.

CO5: Demonstrate good interest and initiative for exploring issues in circular data analysis for a given task.

BSD4723 Decision Analysis

Credit Hour: 3

Prerequisite: None

### Synopsis

Decision analysis is a systemic fundamental knowledge which is needed to justify a complex decision which usually involves many uncertainty, conflicting objectives and risks. This course aims to expose students to the knowledge and methods of decision analysis and tools to solve various decision-making situations in industry. In this course, student will learn the essence of decision making process which includes introduction to decision theory, decision under uncertainty, decision under risk, game theory, social choice theory and multi attribute decision making. This course catalyses both personal skill and technical skill in analysing the best decision which is applicable in various industry settings with the assistance of various conceptual tools and models for decision making support.

### Course Outcome

By the end of semester, students should be able to:

CO1: Use fundamental principle of decision analysis.

CO2: Analyse mathematical problems using decision analysis methods.

CO3: Construct solution to industrial problems using decision analysis tools.

CO4: Demonstrate an active communication skill through group discussion and presentation.

CO5: Initiate the exploration of issues in decision analysis for a given task.

BSD4733 Forensic Data Analysis

Credit Hour: 3

Prerequisite: BSD2423

### Synopsis

Forensic scientists and statisticians are faced with the task of producing, processing,

and presenting correct data that can aid legal decision-makers in recreating previous occurrences. The legal system's simultaneous issue is to strike an ideal balance between quantitative testimony's completeness and comprehensibility. This course introduces the tools of contemporary Bayesian decision theory, demonstrates their use in forensic science using paradigmatic data, and defends the techniques against different challenges. The course covers principles of probability, likelihood, and utility theory before applying them to recurrent statistical issues such as estimation, classification, and choice using Bayes' rule and loss functions.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire knowledge on the process of forensic data analysis.

CO2: Analyse forensic data by using statistical estimation, classify and decide.

CO3: Manipulate the forensic data problems that arise into real-life data using appropriate statistical software.

CO4: Demonstrate verbal communication skills.

CO5: Demonstrate good interest and initiative for exploring issues in forensic data analysis for a given task.

#### BSD4743 Econometrics

Credit Hour: 3

Prerequisite: BUM2413

#### Synopsis

This course provides an introduction to the economics sciences discipline and deals with the analysis of mathematical and statistical data for testing and experimenting with economic theory. Statistical research and quantitative analysis are used to clarify and develop principles of economics. The econometrics methods such as simple linear regression model, multiple linear regression model, violation of basic regression assumptions, logistic regression model and structural break in econometrics data will be

discussed in this course. The aim is to equip graduate students with the econometric methods in the area of economics, business, finance, marketing, management and other disciplines. This course also designed to train students in practical aspects of empirical economics using appropriate software.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire the basic principles of econometric modelling and analysis.

CO2: Analyse various economic data by using appropriate econometric modelling and methods.

CO3: Adapt appropriate software to analyse the economic data of the various application.

CO4: Work collaboratively in groups to analyse real econometric data and document the results.

CO5: Demonstrate good interest and initiative for exploring issues in econometrics for a given task.

BSD4753 Fuzzy Set Theory and Applications

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course will provide the fundamental idea to provide basic and concrete concepts of the fuzzy theory and its applications, and thus on easy illustrations of the basic concepts. It consists of two parts: a theory part and an application part. The first part (theory part) includes introduce basic concepts of fuzzy sets and operations, multi-dimensional fuzzy sets, extensions of the fuzzy theory to the number and function, developments of fuzzy properties on the probability and logic theories. The second part (application part) focusing on application of fuzzy set theory in computerised tasks using appropriate softwares such as Matlab, Microsoft Excel or Python.

#### Course Outcome



By the end of semester, students should be able to:

CO1: Use the fundamental principle of fuzzy set theory.

CO2: Justify critical thinking ideas of fuzzy set theory knowledge in problem-solving situation.

CO3: Conduct appropriate tools to solve uncertain event.

CO4: Demonstrate an active communication skill through group discussion and presentation.

CO5: Initiate fuzzy knowledge to the project and future problems.

#### BSD4763 Geographical Information System

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course is designed to introduce the student to the basic principles and techniques of GIS (Geographic Information Systems). GIS is a computer-based tool that uses spatial (geographic) data to analyse and solve real-world problems. The lab material will emphasises GIS data collection, entry, storage, analysis, and output using ArcGIS. The students will be able to describe what geography and GIS are; will understand the importance of scale, projection, and coordinate systems in GIS; will understand vector and raster data structures and the appropriate use of each of these data structures; will understand the basics of data capture, storage, analysis, and output in a GIS; and will understand typical uses of GIS in business, government, and resource management.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire basic concepts and principles of GIS.

CO2: Apply and analyse spatial data of GIS.

CO3: Conduct appropriate tools to solve GIS problems.

CO4: Demonstrate an active

communication skill through group discussion and presentation.

CO5: Demonstrate good interest and initiative for exploring issues in GIS for a given task.

#### BSD4773 Risk Analysis

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course is an introduction to risk management in several fields, including engineering risk analysis, environmental risk analysis, and security risk analysis. It is also identifying and structuring risk problems, probability and statistics for risk analysis, analytic approaches to risk analysis, simulation models, introduction to multiattribute utility, and application of risk analysis and pitfalls of risk analysis. Many examples will come from real life data. Appropriate software such as R shall be used in this course to implement these ideas in practice.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Analyse knowledge of the basic concepts of risk analysis including probability theory and modeling.

CO2: Decide the analytics approaches to analyse the real risk issues/problem.

CO3: Apply appropriate software tools such as R to help the implementation of risk analysis.

CO4: Work collaboratively in groups to analyse risk analysis problem and document the results.

CO5: Organise various approaches to use the information and other related skills in solving any related problems.

#### BSD4783 Stochastic Analysis and Applications

Credit Hour: 3

Prerequisite: None

## Synopsis

Stochastic analysis is a new way of reasoning which has wide application in all fields of science and engineering. Different from the traditional deterministic approach, stochastic analyses try to obtain useful information from seemingly random data, and stochastic models try to develop insights into the nature of randomness. The stochastic mathematics is particularly relevant to statistical physics, biology and life science, nanotechnology, signal processing and communications, and many branches of science and engineering, as well as economics and finance. The course will be taught from an application standpoint with examples from many different fields. Appropriate software such as Python shall be used in this course to implement these ideas in practice.

## Course Outcome

By the end of semester, students should be able to:

- CO1: Acquire principle of stochastic process.
- CO2: Analyse mathematical problems using stochastic process knowledge.
- CO3: Provide solution to stochastic problems arise into real life data.
- CO4: Work collaboratively in groups to analyse stochastic problems and document the results.
- CO5: Demonstrate good interest and initiative for exploring issues in stochastic analysis for a given task.

## BSD4812 Industrial Training

Credit Hour: 12

Prerequisite: None

## Synopsis

This course aims to provide chances for the students to practice and apply their knowledge and skills that they have gained during their study. During the industrial training, the students are required to record, report and describe all the activities in a Work Log Book. Students will be supervised

by Industry Coach and Academic Tutor to guide and ensure that the students are able to accomplish the given task and achieve the objectives of this course. At the end of the industrial training period, students need to provide and present Industrial Training Report to describe their personal and technical developments.

## Course Outcome

By the end of semester, students should be able to:

- CO1: Adapt data science tools to manage data related process.
- CO2: Demonstrate interpersonal and social skills.
- CO3: Integrate ideas and skills at different level of tasks effectively.
- CO4: Develop leadership skill and work collaboratively.
- CO5: Practice independent learning, good enthusiasm and professionalism in completing the industrial training.
- CO5: Practice good ethics and professionalism in the workplace

**CURRICULUM STRUCTURE  
CENTRE FOR MATHEMATICAL STRUCTURE  
MATHEMATICS SERVICE COURSES**

<b>NO.</b>	<b>CODE</b>	<b>COURSE</b>	<b>CREDIT HOUR</b>
1	BUM1113	Technical Mathematics	3
2	BUM1123	Mathematics for Management	3
3	BUM1133	Mathematics for Computer Graphics	3
4	BUM1153	Intermediate Mathematics	3
5	BUM1223	Calculus	3
6	BUM1233	Discrete mathematics and applications	3
7	BUM1433	Discrete Structure & Applications	3
8	BUM2113	Applied Mathematics	3
9	BUM2123	Applied Calculus	3
10	BUM2133	Ordinary Differential Equations	3
11	BUM2143	Applied Calculus	3
12	BUM2153	Ordinary Differential Equations	3
13	BUM2413	Applied Statistics	3
14	BUM2433	Statistics for Management	3
15	BUM2443	Applied Statistics	3
16	DUM1113	Basic Mathematics	3
17	DUM1123	Calculus	3
18	DUM1163	Elementary Mathematics	3
19	DUM1233	Discrete Mathematics & Applications	3
20	DUM1433	Discrete Structure & Applications	3
21	DUM2143	Advanced Calculus	3
22	DUM2423	Statistics	3
23	DUM2512	Introduction to Data Science	2

**COURSE SYNOPSIS****DEGREE COURSES**

BUM1113

Technical Mathematics

Credit Hour: 3

Prerequisite: None

**Synopsis**

This course introduces and discusses the fundamental of mathematics focusing on providing a solid concept of foundation for further work. Student are exposed to functions and graphs, exponential and logarithmic functions, trigonometric functions, analytic trigonometry, polar coordinates, and conic sections. Appropriate software is used by students to implement some of these ideas in practice.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of functions and trigonometric.

CO2: Apply appropriate mathematics concepts to solve various problems.

BUM1123

Mathematics for Management

Credit Hour: 3

Prerequisite: None

**Synopsis**

This subject introduces the use of mathematical technique in the field of business administration and management. The topics introduce to the inequality, matrices, functions and the key business topics such as simple interest, compound interest, promissory notes, trade and cash discount, markup and markdown.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Acquire basic principles and methodologies of mathematics to solve

problems.

CO2: Apply mathematical concepts and techniques in business administration, management and finance.

BUM1133

Mathematics for Computer Graphics

Credit Hour: 3

Prerequisite: None

**Synopsis**

The aim of this course is to introduce and develop mathematical skills that underpin the technical aspects of computer graphics application. It will emphasize on matrix, vector, geometry and parametric representation, general concept of Basic Mathematics, Vector Calculus and Numerical Methods. For further understanding about this subject, a lot of exercises will be given. At the end of the course, students should be able to grasp key concept and uses each of the mathematical concept in computer graphics application. Appropriate software is used by students to implement some of these ideas in practice.

**Course Outcome**

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of mathematics for computer science

CO2: Demonstrate the calculations through mathematical formulas and equations.

BUM1153

Intermediate Mathematics

Credit Hour: 3

Prerequisite: None

**Synopsis**

This course develops fundamental mathematical concepts for various field of study. Student are exposed to indices and logarithm, sequence and series, vectors, differentiation and integration. It also integrates symbolic tools and graphical

concepts to solve mathematical problems.  
Course Outcome

By the end of semester, students should be able to:

CO1: Acquire the fundamental mathematical concepts

CO2: Apply the appropriate method to solve mathematical problems.

BUM1223

Calculus

Credit Hour: 3

Prerequisite: None

Synopsis

This course covers the fundamental concepts of differentiation and integration for functions of one variable. Students will also learn how to apply the concepts of calculus to solve a variety of problem

situations. Topics of the course are divided into four modules: Module 1: Limit and Continuity (Chapter 1) and Differentiation (Chapter 2), Module 2: Applications of Differentiation (Chapter 3), Module 3: Integration (Chapter 4), and Module 4: Applications of Integration (Chapter 5). Students will sit for a test after each module is completed and a final assessment will be the final examination (comprehensive).

Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of differentiation.

CO2: Apply appropriate calculus concepts to solve various technological problems.

BUM1233

Discrete Mathematics and Applications

Credit Hour: 3

Prerequisite: None

Synopsis

This subject introduces and discusses the

fundamental of the discrete as apply to computer science, focusing on providing a basic theoretical foundation for further work. Students are exposed to logic and proof techniques, set theory, elementary number of theory, functions and relations, graph, tress, modelling computations and abstract algebra. This course integrates symbolic tools, graphical concepts, and numerical calculations.

Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of discrete mathematics.

CO2: Analyze mathematical problem using discrete mathematics.

CO3: Provide solution to discrete mathematics problems arise from computer science and engineering field.

BUM1433

Discrete Structure & Applications

Credit Hour: 3

Prerequisite: None

Synopsis

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focusing on providing a basic theoretical foundation for further work. Students are exposed to basic counting; discrete probability; numerical, precision, accuracy and errors; graph; tress and modelling computations. This course integrates symbolic tools, graphical concepts and numerical calculations.

Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of discrete structure.

CO2: Analyze mathematical problems using discrete structure knowledge.

CO3: Provide solution to discrete structure problems arise in computer science and engineering fields.

BUM2113  
Applied Mathematics  
Credit Hour: 3  
Prerequisite: None  
Synopsis

This course introduces ordinary differential equations (analytically and numerically), Laplace transforms and Fourier series. Related applications are also discussed.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of first and second order ordinary differential equations, Laplace transforms, numerical method to solve initial and boundary value problem and Fourier series.

CO2: Analyse and solve various differential equation of first and second order differential equations, Laplace transforms and find Fourier series for various periodic functions.

BUM2123  
Applied Calculus  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course introduces Polar Coordinates and Vector, Vector-Valued Functions, Partial Derivatives, and Multiple Integrals. Appropriate software is used by students to implement some of these ideas in practice.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental calculus concepts of equations and vectors.

CO2: Analyse and solve wide range of problems in science and engineering by using concept of calculus.

BUM2133  
Ordinary Differential Equations  
Credit Hour: 3  
Prerequisite: None  
Synopsis

This course introduces to the Ordinary differential equations, Laplace transform and Fourier series and their applications in solving engineering problems.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of first and second order ordinary differential equations, Laplace transforms and Fourier series.

CO2: Analyse and solve various differential equation of first order differential equations, second order differential equations, Laplace transforms and find Fourier series for various periodic functions.

BUM2143  
Applied Calculus  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course introduces Polar Coordinates and Vector, Vector-Valued Functions, Partial Derivatives, and Multiple Integrals. Appropriate software is used by students to implement some of these ideas in practice.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental calculus concepts of equations and vectors.

CO2: Analyse and solve wide range of problems in science and engineering by using concept of calculus.

BUM2153  
Ordinary Differential Equations  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course introduces to the Ordinary differential equations, Laplace transform and Fourier series and their applications in solving engineering problems.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of first and second order ordinary differential equations, Laplace transforms and Fourier series.

CO2: Analyze and solve differential equation of first order differential equations, second order differential equations, Laplace transforms and find Fourier series for periodic functions.

BUM2413  
Applied Statistics  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course discusses on statistical problem-solving methodology and descriptive statistics; sampling distribution and confidence interval; hypothesis testing; analysis of variance (ANOVA); goodness-of fit test and contingency tables; regression and correlation including simple and multiple linear regressions. Microsoft Excel software will be used in this course as a statistical package (other statistical packages are SPSS, R Language, S Plus, EViews and Minitab shall be used in this course).

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of statistics.

CO2: Perform statistical analysis by

using appropriate statistical theory and methodology.

CO3: Analyse real life data to solve related problems in various disciplines.

BUM2433  
Statistics for Management  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course discusses on descriptive statistics; graphical summary; common probability distributions; statistical analysis for means; regression and correlation including simple and multiple linear regressions, and goodness of fit test and contingency tables. Statistical packages such as Microsoft Excel, SPSS, R Language, EViews and Minitab shall be used in this course.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of statistics.

CO2: Perform statistical analysis by using appropriate statistical theory and methodology.

CO3: Analyse real life data to solve related problems in various disciplines.

BUM2443  
Applied for Statistics  
Credit Hour: 3  
Prerequisite: None

#### Synopsis

This course discusses on statistical problem-solving methodology and descriptive statistics; sampling distribution and confidence interval; hypothesis testing; analysis of variance; goodness-of fit test and contingency tables; regression and correlation including simple and multiple linear regressions. Microsoft Excel software will be used in this course as a statistical package.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of statistics.

CO2: Perform statistical analysis by using appropriate statistical theory and methodology.

CO3: Analyse real life data to solve related problems in various disciplines.

### **DIPLOMA COURSES**

DUM1113

Basic Mathematics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces and discusses the fundamental of mathematics focusing on providing a solid theoretical foundation for further work. Student are exposed to number system, equations, inequalities and absolute value, polynomials, sequences and series, matrices and system of linear equations, functions and graphs, and trigonometric functions. This course also integrates symbolic tools, graphical concepts, and numerical calculations.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire the fundamental principles of basic mathematics.

CO2: Apply the appropriate method to solve mathematical problems.

DUM1123

Calculus

Credit Hour: 3

Prerequisite: DUM1113

#### Synopsis

Calculus is the mathematics of change, of calculating problems that are continually evolving. This is possible by breaking such problems into infinitesimal steps, solving

each of those steps, and adding all the results. Rather than doing each step individually, calculus allows these computations to be done simultaneously. There are two primary branches of calculus: differential calculus (differentiation) and integral calculus (integration). Therefore, students are exposed to limits and continuity, differentiation, application of differentiation, integration, and application of integration. This course integrates symbolic tools, graphical concepts and numerical calculations.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire and apply the fundamental principles of calculus.

CO2: Apply the appropriate method studied to solve mathematical problems.

CO3: Provide solution to solve mathematical problem arise from real life.

DUM1163

Elementary Mathematics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course provides an introduction to the basic concepts and techniques of algebra and calculus. Students are exposed to functions, linear, quadratic equations, differentiation, application of differentiation, integration and application of integration. Therefore, it also develops problem skills to solve applications in engineering and science areas.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire the fundamental principle of algebra and calculus.

CO2: Apply the appropriate method to solve mathematical problems.



### DUM1233

Discrete Mathematics & Applications

Credit Hour: 3

Prerequisite: None

#### Synopsis

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focussing on providing a basic theoretical foundation for further work. Students are exposed to elementary number theory, set theory, functions and relations, logic, proof techniques and Boolean algebra. This course integrates symbolic tools, graphical concepts, and numeral calculations.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of discrete mathematics.

CO2: Analyze mathematical problem using discrete mathematics.

### DUM1433

Discrete Structure & Applications

Credit Hour: 3

Prerequisite: None

#### Synopsis

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focussing on providing a basic theoretical foundation for further work. Students are exposed to basic counting, discrete probability, graph tree, modelling computation and numerical precision. This course integrates symbolic tools, graphical concepts, and numeral calculations.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principle of discrete structure.

CO2: Analyze mathematical problem using discrete structure knowledge.

### DUM2143

Advanced Calculus

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course introduces Polar Coordinates and Vector, Vector Valued Functions, Partial Derivatives and Multiple Integrals. Appropriate software is used by students to implement some of these ideas in practice.

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principles of polar coordinates, vectors and the geometry of spaces

CO2: Solve systems of vector valued functions, partial derivatives of functions of several variables and multiple integration problem.

### DUM2423

Statistics

Credit Hour: 3

Prerequisite: None

#### Synopsis

This course discusses on descriptive statistics, graphical summary, common probability distributions; statistical analysis for means, simple linear regression and correlation, and goodness of fit and contingency tables. Microsoft Excel software will be used in this course as a statistical package (others statistical package are SPSS, R Language, S Plus, EViews and Minitab shall be used in this course).

#### Course Outcome

By the end of semester, students should be able to:

CO1: Acquire fundamental principles of statistics.

CO2: Perform statistical analysis by

using appropriate statistical theory and methodology

CO3: Analyse real life data to solve related problems in various disciplines.

DUM2512

Introduction to Data Science

Credit Hour: 2

Prerequisite: None

### Synopsis

Data science is the emerging interdisciplinary field that lies at the intersection of which requires the tools of extracting meaningful insights from the big data stored in the data sets. This course presents the overview of data science, big data, the process of data science, its infrastructure and computing for data

science. This course is aimed to produce graduates who are knowledgeable, skilled and able to emerging technologies based on the knowledge of mathematics, statistics, computer science and domain expertise for storing, analysing and managing the big data.

### Course Outcome

By the end of semester, students should be able to:

CO1: Explain the terminologies used in data science.

CO2: Distinguish the data science basic foundation, process, infrastructure and required computing tools.

CO3: Communicate effectively in written and oral forms by completing the task given





# **CENTRE FOR MODERN LANGUAGE**

**COURSE INFORMATION 2022-2023**

## **CURRICULUM STRUCTURE**

### **COURSES OFFERED**

#### **Courses offered by CML include:**

Courses offered by the Division of English Language  
Courses offered by the Division of Foreign Languages  
Elective courses

#### **English Language Courses**

Diploma (3 levels) – 2 credit hours

UHL2442 Essential English  
UHL2412 English for Academic Communication  
UHL2432 English for Professional Communication

Degree (4 levels) – 2 credit hours

UHL2400 Fundamentals of English Language  
UHL2412 English for Academic Communication  
UHL2422 English for Technical Communication  
UHL2432 English for Professional Communication

Bachelor of Technology Programme

UHL2442 Essential English  
UHL2452 English for Vocational Purposes

#### **Foreign Language Courses**

Diploma – 2 credit hours

UHF1192 Bahasa Melayu Komunikasi Asas (For international students only)

Degree

Students must select one (1) foreign language courses and complete two levels.

Beginners Level – 1 credit hour

UHF1111 Mandarin for Beginners  
UHF1121 German for Beginners  
UHF1131 Japanese for Beginners  
UHF1141 Arabic for Beginners  
UHF1151 Spanish for Beginners

Intermediate Level – 1 credit hour

UHF2111 Mandarin for Intermediate  
UHF2121 German for Intermediate  
UHF2131 Japanese for Intermediate  
UHF2141 Arabic for Intermediate  
UHF2151 Spanish for Intermediate  
UHF2192 Bahasa Melayu Komunikasi (For international students only)

### **Single Degree Programme**

Faculty of Industrial Management (FIM) – BPE PROGRAM ONLY

UHG2212	German 1
UHG2222	German 2
UHG2232	German 3
UHG2422	German 4

### **Double Degree Programme**

Faculty of Manufacturing and Mechatronics Engineering Technology (FTKPM)  
Faculty of Mechanical and Automotive Engineering Technology (FTKMA)

UHD2313	German A1
UHD2323	German A2
UHD2333	German B1.1
UHD2343	German B1.2
UHD2353	German B2.1
UHD2363	German B2.2

Faculty of Industrial Management (FIM)

UHG2313	German A1
UHG2323	German A2
UHG2333	German B1.1
UHG2343	German B1.2
UHG2353	German B2.1
UHG2363	German B2.2

### **Elective Courses**

UHE3022	Critical Thinking through Literature
UHE3082	Creative Writing
UHE3092	English Mechanics
UHE3132	Public Speaking
UHE3142	Project Based Proposal Writing
UHE3152	Interpersonal Effectiveness
UHE3512	Conversational Arabic for Tourism
UHE3612	Bahasa Melayu Dokumentasi

## **COURSE SYNOPSIS**

### **DEPARTMENT OF ENGLISH LANGUAGE**

#### **DIPLOMA COURSES**

Course Code: UHL2442  
Course: ESSENTIAL ENGLISH  
Pre-requisite: None

#### **Synopsis**

The course is essential to strengthen the four language skills which are listening, speaking, reading and writing on topics of familiar subjects within the students' fields of interest. Students will be taught the basics of paragraph writing to form a complete essay comprising of introduction, body and conclusion. This course also develops the students' reading skills by employing various reading strategies. Students will develop the ability to listen for specific information and communicate with some confidence on familiar routine and non-routine matters. The course is defined within the CEFR high A2 to B1 level.

#### **Course Outcomes**

- CO1 Respond to written texts based on short oral discourses.
- CO2 Identify relevant information in straightforward factual texts.
- CO3 Write a 4-paragraph essay complete with an introduction and a conclusion.
- CO4 Discuss routine and non-routine matters on familiar subjects.

#### **References**

1. Soars, L. & Soars, J. (2015). Academic skills: Reading, writing and study skills. Oxford University Press.
2. Bland, S. K. (2012). Grammar Sense 3. Oxford University Press.
3. Brown, J. (2014). Return of the Padawan. Scholastic Incorporated.

4. Brown, J. (2015). The Phantom Bully. Scholastic Incorporated.
5. Brown, J. (2013). Jedi Academy. Scholastic Incorporated.
6. Cole, V. (2012). IELTS introduction: Study Skills pack. Macmillan Education.
7. Craven, M. & Donalley-Sherman, K. (2015). Q Skills for success: Listening and speaking 3. Oxford University Press.
8. Krosoczka, J. J. (2018). The Principal Strikes Back. Scholastic Incorporated.
9. Krosoczka, J. J. (2016). A New Class. Scholastic Incorporated.
10. Krosoczka, J. J. (2019). Revenge of The Sis. Scholastic Incorporated.

Course Code: UHL2412  
Course: ENGLISH FOR ACADEMIC COMMUNICATION  
Pre-requisite: UHL 2442 Essential English

#### **Synopsis**

The course aims to equip students with the four language skills (i.e. listening, reading, speaking and writing) as well as study skills which include note taking and note making techniques, and active listening skills for academic success. Students will have the opportunity to read texts of various topics by incorporating essential reading skills. Additionally, students are also expected to demonstrate effective presentation skills in delivering speeches. Students will also be required to write thesis-support essays, applying appropriate writing styles and organization as well as integrating APA writing conventions. E-learning platforms will be an integral part of the course. This course is defined within the CEFR B1 to B2 level.

#### **Course Outcomes**

- CO1 Respond effectively by using appropriate and accurate language in written and/or spoken discourse.
- CO2 Identify specific and significant information from various texts and purposes.

- CO3 Demonstrate effective persuasive presentation using appropriate delivery skills.
- CO4 Organise salient information from different sources.

#### References

1. Aisyah Hanum Abu Bakar, Asiah Kassim, Fathiah Izzati Mohamad Fadzillah, Hafizoah Kassim, Hamizah Zahari, Mohd Shafiq Abdul Jabar, Nur Syafawati Sabuan. (2019). *English for Academic Communication* UHL2412. CMLHS UMP
2. <https://www.youtube.com/w> (Context Clues)
3. <https://www.youtube.com/w> (Determining & Placing In-Text)
4. <https://www.youtube.com/w> (Effective Delivery)
5. <https://www.youtube.com/w> (Examples of Attention Getters)
6. <https://www.youtube.com/w> (Formats of Writing In-Text)
7. <https://www.youtube.com/w> (How to open dan close)
8. <https://www.youtube.com/w> (Language Expression in In-Text)
9. <https://www.youtube.com/w> (Paraphrasing and Its)
10. <https://www.youtube.com/w> (Reference Word)

Course Code: UHL2432

Course: ENGLISH FOR PROFESSIONAL COMMUNICATION

Pre-requisite: UHL2412 English for Academic Communication

#### Synopsis

The course is designed to develop students' spoken and written communication skills effectively. This is vital in helping them to enter the job market and preparing them for workplace. Students will enhance their language skills via learning activities that incorporate communication strategies, interactions and feedback. The learning activities include, but not limited to, carrying out presentations, preparing job application documents, attending mock-job interviews

and conducting meetings. This course is defined within the CEFR high B2 to low C1 level.

#### Course Outcomes

- CO1 Prepare job application documents using appropriate language and strategies.
- CO2 Influence others through ideas and opinions using appropriate word choice, complex language structures, and effective delivery strategies in a mock job interview.
- CO3 Display effective communication in meetings and in related meeting documents using appropriate language and strategies.

#### References

1. Aina Suriani, M. et al. (2015). *Business Communication*. Cengage Learning Asia Pte Ltd.
2. Bovee, C., & Thill, J. (2019). *Business Communication Essentials: Fundamental Skills for the Mobile-Digital-Social Workplace* (8<sup>th</sup> ed.) Pearson Education.
3. Dignen, B. (2003). *Communicating in Business English*. Compass Publishing Inc.
4. Guffey, M. E., & Loewy, D. (2019). *Essentials of Business Communication* (11<sup>th</sup> ed.). Cengage Learning.
5. Kalpana, S., Noreha, T., Bhajan Kaur, S.S., & Rajendra, S. (2006). *A Practical Guide to Business Meetings*. Mc Graw Hill.
6. Kolin, P. C. (2017). *Successful Writing at Work* (11<sup>th</sup> ed.). Cengage Learning.
7. Shak, P., & Kamlun, K. (2015). *Ready to Work: English for Employment*. Cengage Learning Asia Pte. Ltd.

#### DEGREE COURSES

Course Code: UHL2400

Course: FUNDAMENTALS OF ENGLISH LANGUAGE

Pre-requisite: None



### Synopsis

The course serves as an intervention programme providing the students the opportunity to speak, listen, and write on topics of familiar subjects. It provides students with the fundamentals of the language and a foundation for advancing through the next three required levels of English language courses. Vocabulary development is promoted through receptive activities which are listening and reading. In addition, strong attention is given to production activities which are writing and speaking. The course is defined within the CEFR A2-B1 levels.

### Course Outcomes

- CO1 Differentiate between main ideas and supporting details in spoken texts on familiar subjects.
- CO2 Identify specific and predictable information in simple short texts.
- CO3 Write straightforward connected texts on familiar subjects using the basic essay structure.
- CO4 Discuss effectively on routine and non-routine matters of familiar subjects.

### References

1. Craven, M. & Donalley-Sherman, K. (2015). Q skills for success: Listening and speaking 3. Oxford: Oxford University Press.
2. Soars, L. & Soars, J. (2015). Academic skills: Reading, writing, and study skills. Oxford: Oxford University Press.
3. Soars, L., Soars, J. & Hancock, P. (2020). Headway: Intermediate Workbook. 5<sup>th</sup> Revised Edition. Oxford University Press.
4. <https://www.bbc.co.uk/learningenglish/>
5. <https://www.bbc.co.uk/learningenglish/>
6. Bland, S. K. (2012). Grammar sense 3. Oxford University Press.
7. <https://learnenglish.britishcouncil.org>
8. <https://www.cambridgeenglish.org/exams-and-tests/cefr/>

9. Cole, V. (2012). IELTS introduction: Study skills pack. London: Macmillan Education.
10. <https://www.time4writing.com/>

Course Code: UHL2412

Course: ENGLISH FOR ACADEMIC COMMUNICATION

Pre-requisite: UHL 2400 Fundamentals of English Language

### Synopsis

The course aims to equip students with the four language skills (i.e. listening, reading, speaking and writing) as well as study skills which include note taking and note making techniques, and active listening skills for academic success. Students will have the opportunity to read texts of various topics by incorporating essential reading skills. Additionally, students are also expected to demonstrate effective presentation skills in delivering speeches. Students will also be required to write thesis-support essays, applying appropriate writing styles and organization as well as integrating APA writing conventions. E-learning platforms will be an integral part of the course. This course is defined within the CEFR B1 to B2 level.

### Course Outcomes

- CO1 Respond effectively by using appropriate and accurate language in written and/or spoken discourse.
- CO2 Identify specific and significant information from various texts and purposes.
- CO3 Demonstrate effective persuasive presentation using appropriate delivery skills.
- CO4 Organise salient information from different sources.

### References

1. Asiah Kassim et.al. (2019). English for Academic Communication. CML UMP.
2. <https://www.youtube.com/w> (Context Clues)
3. <https://www.youtube.com/w> (Determining & Placing In-Text)

Course Code: UHL2422  
 Course: ENGLISH FOR TECHNICAL COMMUNICATION  
 Pre-requisite: UHL2412 English for Academic Communication

#### Synopsis

The course is designed for technical communication relevant to academic and professional purposes. It provides opportunities for students to learn and employ language skills and strategies appropriate to written and spoken technical communication for technical and non-technical audiences. Students will be able to listen to, evaluate, organize, present and write technical information. The contents of this course consist of technical descriptions, technical processes and procedures, feasibility and recommendation reports. Additionally, students will collaborate in teams while performing activities assigned to them. Students are encouraged to benefit in language learning when they engage in self-access activities. The course is defined within the CEFR high B2 to low C1 level.

#### Course Outcomes

- CO1 Explain technical description using appropriate content, skills, and strategies in a technical product presentation.
- CO2 Identify salient information in Standard Operating Procedure texts.
- CO3 Propose a recommendation effectively using appropriate skills and strategies.

#### References

1. Tebeaux, E., & Dragga, S. (2017). The essentials of technical communication (4<sup>th</sup> ed.). Oxford University Press.
2. Brigeftord, T. (2018). Teaching professional & technical communication: A practicum in a book (1<sup>st</sup> ed.). Utah State University Press.
3. Walter, E. O., Charles, T. B. & Gerald, J. A. (2020). Writing that works: Communicating effectively on the job with 2020 APA update (13<sup>th</sup> ed.). Bedford/St. Martin's.

4. Ghetto, G., Jack, T. L., & Ruszkiewicz, S. (2019). Content strategy in technical communication (1<sup>st</sup> ed.). Routledge Press.
5. Lannon, J.M. & Gurak, L.J. (2017). Technical communication. 14<sup>th</sup>. Pearson.
6. Last, S. (2019). Technical writing essentials. 1<sup>st</sup>. University of Victoria.
7. Walter, E. O., Charles, T. B. & Gerald, J. A. (2020). Writing that works: Communicating effectively on the job with 2020 APA update. 13<sup>th</sup>. Bedford/St. Martin's.

Course Code: UHL2432  
 Course: ENGLISH FOR PROFESSIONAL COMMUNICATION  
 Pre-requisite: UHL2412 English for Academic Communication

#### Synopsis

The course is designed to develop students' spoken and written communication skills effectively. This is vital in helping them to enter the job market and preparing them for workplace. Students will enhance their language skills via learning activities that incorporate communication strategies, interactions and feedback. The learning activities include, but not limited to, carrying out presentations, preparing job application documents, attending mock-job interviews and conducting meetings. This course is defined within the CEFR high B2 to low C1 level.

#### Course Outcomes

- CO1 Prepare job application documents using appropriate language and strategies.
- CO2 Influence others through ideas and opinions using appropriate word choice, complex language structures, and effective delivery strategies in a mock job interview.
- CO3 Display effective communication in meetings and in related meeting

documents using appropriate language and strategies.

#### References

1. Aina Suriani, M. et al. (2015). Business Communication. Cengage Learning Asia Pte Ltd.
2. Bovee, C., & Thill, J. (2019). Business Communication Essentials: Fundamental Skills for the Mobile-Digital-Social Workplace (8<sup>th</sup> ed.) Pearson Education.
3. Dignen, B. (2003). Communicating in Business English. Compass Publishing Inc.
4. Guffey, M. E., & Loewy, D. (2019). Essentials of Business Communication (11<sup>th</sup> ed.). Cengage Learning.
5. Kalpana, S., Noreha, T., Bhajan Kaur, S.S., & Rajendra, S. (2006). A Practical Guide to Business Meetings. Mc Graw Hill.
6. Kolin, P. C. (2017). Successful Writing at Work (11th ed.). Cengage Learning.
7. Shak, P., & Kamlun, K. (2015). Ready to Work: English for Employment. Cengage Learning Asia Pte. Ltd.

Course Code: UHL2442

Course: ESSENTIAL ENGLISH

Pre-requisite: None

#### Synopsis

The course is essential to strengthen the four language skills which are listening, speaking, reading, and writing on topics of familiar subjects within the students' fields of interest. Students will be taught the basics of paragraph writing to form a complete essay comprising of introduction, body and conclusion. This course also develops the students' reading skills by employing various reading strategies. Students will develop the ability to listen for specific information and communicate with some confidence on familiar routine and non-routine matters. The course is defined within the CEFR high A2 to B1 level.

#### Course Outcomes

- CO1 Respond to written texts based on short oral discourses.
- CO2 Identify relevant information in straightforward factual Texts.
- CO3 Write a 4-paragraph essay complete with an introduction and a conclusion.
- CO4 Discuss routine and non-routine matters on familiar subjects.

#### References

1. Soars, L. & Soars, J. (2015). Academic skills: Reading, writing and study skills. Oxford University Press.
2. Bland, S. K. (2012). Grammar Sense 3. Oxford University Press.
3. Brown, J. (2014). Return of the Padawan. Scholastic Incorporated.
4. Brown, J. (2015). The Phantom Bully. Scholastic Incorporated.
5. Brown, J. (2013). Jedi Academy. Scholastic Incorporated.
6. Cole, V. (2012). IELTS introduction: Study Skills pack. Macmillan Education.
7. Craven, M. & Donalley-Sherman, K. (2015). Q Skills for success: Listening and speaking 3. Oxford University Press.
8. Krosoczka, J. J. (2018). The Principal Strikes Back. Scholastic Incorporated.
9. Krosoczka, J. J. (2016). A New Class. Scholastic Incorporated.
10. Krosoczka, J. J. (2019). Revenge of The Sis. Scholastic Incorporated.

Course Code: UHL2452

Course: ENGLISH FOR VOCATIONAL PURPOSES

Pre-requisite: UHL2442 ESSENTIAL ENGLISH

#### Synopsis

The course is designed to provide technical students with skills and knowledge for workplace. It provides opportunities for students to learn and employ language skills and strategies appropriate to written and spoken discourse for specific

audiences. The contents of this course consist of technical processes and procedures, technical descriptions and job interview process. Students are required to listen to, evaluate, organize and write technical information and prepare for a mock-job interview. The learning activities include carrying out presentation, collaborative learning, active-engaged learning and online learning. The course is defined within the CEFR B2 to low C1 level.

#### Course Outcomes

- CO1 Determine salient information from different processes and procedure sources.
- CO2 Analyse salient information from technical written materials and documents.
- CO3 Demonstrate presentation skills using appropriate content, accurate language and effective delivery strategies in describing products.
- CO4 Express ideas effectively using appropriate language in resumes and a mock-job interview.

### DEPARTMENT OF FOREIGN LANGUAGES

Offered to diploma students only (international student)

Course Code: UHF1192

Course: BAHASA MELAYU KOMUNIKASI ASAS

Pre-requisite: None

#### Synopsis

Kursus ini melatih pelajar antarabangsa untuk berkomunikasi dalam bahasa Melayu asas yang meliputi situasi kehidupan harian. Pelajar akan diperkenalkan dengan pertuturan dan penulisan bahasa Melayu mudah. Secara asasnya, pelajar akan mempelajari bunyi dan sebutan yang terdapat didalam sistem Bahasa Melayu, seterusnya akan didedahkan dengan persekitaran yang terdekat dengan pelajar yang berkisar tentang diri, keluarga dan

rakan, persekitaran sekeliling, situasi perbualan dan aktiviti melancong di Malaysia. Pengajaran dan pembelajaran akan dilaksanakan dalam bentuk kuliah, tutorial, tugas dan pengalaman pembelajaran pelajar di dalam dan di luar kelas. Pada akhir kursus ini, pelajar diharapkan dapat berkomunikasi dan menulis menggunakan ayat mudah dengan berkesan.

#### Course Outcomes

- CO1 Mengenal bunyi Bahasa Melayu dalam pertuturan harian
- CO2 Menjelaskan maksud teks penuh
- CO3 Bertutur dalam pelbagai situasi dengan menggunakan ayat mudah dan ayat berlapis
- CO4 Menyusun idea secara kreatif dan sistematik dalam penulisan komposisi pendek

#### References

1. Jamilah Bebe Binti Mohamad. (2017). *Modul Malay for intermediate*. Penerbit Universiti Malaysia Pahang.
2. Juwairiah Osman & Jamilah Bebe Mohamad. (2018). *Bahasa Melayu komunikasi*. Penerbit Universiti Malaysia Pahang.
3. Zarina Othman, Roosfa Hashim & Rusdi Abdullah. (2018). *Modul komunikasi bahasa melayu antarabangsa*. Penerbit Universiti Kebangsaan Malaysia.

Offered to degree students only  
Students must select one (1) foreign language courses and complete two levels.

#### *Beginners Level*

Course Code: UHF1111

Course: MANDARIN FOR BEGINNERS

Pre-requisite: none

#### Synopsis

The course aims to enable students to speak simple Mandarin in clearly defined, familiar everyday contexts. The students will learn Chinese Phonetics (Hanyu Pinyin System) and about 150 vocabulary based

on the Chinese Proficiency Test, *Hanyu Shuiping Kaoshi* (HSK) Level One. Students will be exposed to simple phrases, basic sentence structures and dialogues. Practices that are based on HSK Level One grammar points are also introduced. Classroom activities will include listening, speaking, reading and writing. The students will be evaluated based on the four language skills. The course is defined within the Common European Framework of References for Languages (CEFR) low-A1 to intermediate A1 or HSK Level 1.

#### Course Outcomes

- CO1 Recognize pronunciation of simple Chinese phrases, sentences and dialogue from audio media or recordings in clearly defined, familiar everyday contexts.
- CO2 Identify information about familiar subject from straight-forward connected pictures and sentences.
- CO3 Describe topics of personal interests in clearly defined, familiar contexts using appropriate and accurate Chinese sentences and pronunciation.
- CO4 Write simple sentences and short passage in Hanyu Pinyin about clearly defined, familiar contexts.

#### References

1. Confucius Institute Headquarters (Hanban). (2015). *HSK test syllabus level 1*. People's Education Press.
2. Jiang, L. (2014). *HSK standard course 1: text book*. Beijing Language and Culture University Press.
3. Jiang, L. (2014). *HSK standard course 1: text book*. Beijing Language and Culture University Press.
4. Yong, Y. M., & Cheng, C. Y. (2018). *Mandarin for all: book 1* (2<sup>nd</sup> edition). Penerbit Universiti Malaysia Pahang.

Course Code: UHF1121

Course: GERMAN FOR BEGINNERS

Pre-requisite: none

#### Synopsis

This course is designed to give students an exposure to German language and culture as similar in German-speaking countries in clearly defined, familiar, everyday contexts. Students will be exposed to simple phrases and basic sentence structures. The course covers the basic language skills of listening, reading, speaking and writing. Lessons are composed of individual and group work, role-play and simulation. The course is defined within the CEFR pre-A1 to low A1 level.

#### Course Outcomes

- CO1 Recognise pronunciation of simple words, phrases and sentences from short audio media or recordings in clearly defined, familiar everyday contexts.
- CO2 Identify information about familiar subjects from short and simple texts.
- CO3 Describe topics of personal interests in clearly defined, familiar everyday contexts using simple German sentences.
- CO4 Write simple phrases and sentences in German about clearly defined, familiar everyday contexts.

#### References

1. Deutsche, Welle. (2022). *Learn German*. <https://learngerman.dw.com/en/overview/>
2. Knirsch, M. & Verlag, M. V. (2010). *Hören and sprechen A1*. Verlag GmbH & Co. KG.
3. Niebisch, D., Penning-Hiemstra, S., Specht F., Bovermann, M. & Reimann, M. (2013). *Schritte international 1: deutsch als fremdsprache/kursbuch + arbeitsbuch*. Verlag GmbH & Co. KG. 2013.
4. Niebisch, D., Penning-Hiemstra, S., Specht F., Bovermann, M. & Reimann, M. (2013). *Schritte international 2: Deutsch als fremdsprache/kursbuch + arbeitsbuch*. Verlag GmbH & Co. KG.

Course Code: UHF1131

Course: JAPANESE FOR BEGINNERS

Pre-requisite: none

### Synopsis

The course aims to enable students to speak simple Japanese in clearly defined, familiar everyday contexts. Students will be exposed to Japanese vocabulary, simple phrases and basic sentence structures. The students also will practise Japanese Phonetics. Classroom activities will include listening, speaking, reading and writing. The students will be evaluated based on the four language skills. The course is defined within the Common European Framework of References for Languages (CEFR) low A1 to intermediate A1 level.

### Course Outcomes

- CO1 Recognize pronunciation of simple Japanese words and sentences from audio media or recordings in clearly defined, familiar everyday contexts.
- CO2 Identify information about familiar subjects from straight-forward connected texts.
- CO3 Describe topics of personal interests in clearly defined, familiar contexts using simple Japanese sentences.
- CO4 Write simple words and sentences in Hiragana in clearly defined, familiar everyday contexts.

### References

1. Mohd Iszuani Bin Mohd Hassan. (2021). *Iszuanihongo 1*. Penerbit Universiti Malaysia Pahang.
2. Graham, R. (2019). *Learn Japanese: GenkiJapan.net intro video*. Genki Japan.net. [www.learn-hiragana-katakana.com](http://www.learn-hiragana-katakana.com)
3. Minna No Nihongo Elementary1-1. (2006). *Asian edition*. The Association for Overseas Technical Scholarship (AOTS)

Course Code: UHF1141

Course: ARABIC FOR BEGINNERS

Pre-requisite: none

### Synopsis

This course focuses on basic Arabic communicative skills. Learning in the classroom will be based on language tasks that students can use in clearly defined, familiar everyday contexts. Students will be equipped with basic Arabic to communicate in daily activities such as greetings, introducing oneself, social encounter with friends and so forth. Students will learn to write simple sentences in Arabic. The course is defined within the Common European Framework of References for Languages (CEFR) low A1 to intermediate A1 level.

### Course Outcomes

- CO1 Recognise pronunciation of simple Arabic words, phrases and sentences from short audio media or recording in clearly defined, familiar everyday contexts
- CO2 Identify information about familiar subjects from straight-forward connected texts in clearly defined, familiar contexts using simple Arabic sentences
- CO3 Describe topics of personal interests in clearly defined, familiar contexts using simple Arabic sentences
- CO4 Write simple phrases and sentences in Arabic in clearly defined, familiar everyday contexts using simple Arabic sentences.

### References

1. Asar Abdul Karim. (2009). *Bahasa Arab untuk semua*. Penerbit Universiti Malaysia Pahang.
2. EL RESALA.ARABIC. (2017). <http://www.mualimahrosjuliana.wixsite.com/website>
3. Madinah Arabic FZE. (2020). *Learn Arabic with Madinah Arabic* [www.madinaharabic.com](http://www.madinaharabic.com)
4. Mardhiyyah Zamani, Mohammad Baihaqi Hasni, Rosjuliana Hidayu Rosli, & Farah Hanan Aminallah. (2018). *Arabic for beginners*. Penerbit UMP.
5. Mardhiyyah Zamani, Rosjuliana Hidayu Rosli, & Mohammad Baihaqi Hasni. (2012). *Arabic for beginners*. Penerbit UMP.

6. Marzuki Yaakob, & Abdul Hadi Mohd Salleh. (2013). *At-taujih fil'arabiyyah al-ittisaliyyah* UITM, Shah Alam

Course Code: UHF1151  
Course: SPANISH FOR BEGINNERS  
Pre-requisite: none

#### Synopsis

This course focuses on basic Spanish communicative skills. Learning in the classroom will be based on language tasks that students can use in clearly defined, familiar everyday contexts. Students will be equipped with basic Spanish to communicate in daily activities such as greetings, introducing oneself, social encounter with friends and so forth. Students will learn to write simple sentences in Spanish. The course is defined within the Common European Framework of References for Languages (CEFR) of low A1 to intermediate A1 level.

#### Course Outcomes

- CO1 Recognise pronunciation of simple Spanish words, phrases and sentences from short audio media or recordings in clearly defined, familiar everyday contexts
- CO2 Identify information about familiar subjects from straight-forward connected texts in clearly defined, familiar everyday contexts using simple Spanish sentences
- CO3 Describe topics of personal interests in clearly defined, familiar everyday contexts using simple Spanish sentences
- CO4 Write simple phrases and sentences in Spanish in clearly defined, familiar everyday contexts using simple Spanish sentences

#### References

1. Azlina Mohd Ariffin. (2017). *Estudiar Espanol conmigo (level 1)*. Penerbit Universiti Malaysia Pahang.

2. Collins Dictionaries. (2016). *Dictionary English to Spanish, Spanish to English* (4<sup>th</sup> edition). Harper Collins Publisher.
3. Harvey, W. C. (2015). *Spanish every day* (2<sup>nd</sup> edition). Barron's Educational Series.
4. Richmond, D. (2015). *Basic Spanish*. Mcgraw-Hill Education.

#### Intermediate Level

Course Code: UHF2111  
Course: MANDARIN FOR INTERMEDIATE  
Pre-requisite: UHF1111 Mandarin for Beginners

#### Synopsis

The course aims to expose students to speak Mandarin in related areas of most immediate relevance (e.g asking for directions, travelling, food and drinks, weather, sickness). The students will continue to practice the use of Chinese Phonetics (Hanyu Pinyin System). They will also learn about 300 vocabulary and are expected to use simple Chinese phrases, sentences structures and dialogues suggested based on the Chinese Proficiency Test, *Hanyu Shuiping Kaoshi* (HSK) Level Two. Practices that are based on HSK Level Two grammar points are also introduced. Classroom activities will focus on language skills practices in listening, speaking, reading and writing. The students will be evaluated based on the four language skills. The course is defined within the Common European Framework of References for Languages (CEFR) intermediate A1 to low A2 or HSK Level 2.

#### Course Outcomes

- CO1 Recognise pronunciation of Chinese simple sentences and dialogues from audio media or recordings related to areas of most immediate relevance.
- CO2 Identify information related to areas of most immediate relevance from pictures and sentences.
- CO3 Describe topics related to areas of most immediate relevance using

appropriate and accurate Chinese sentences and pronunciation.

- CO4 Write simple sentences and short passages in *Hanyu Pinyin* related to areas of most immediate relevance.

#### References

1. Confucius Institute Headquarters (Hanban). (2014). *Official examination papers of HSK (level 2)*. Higher Education Press.
2. Confucius Institute Headquarters (Hanban). (2015). *HSK test syllabus level 2*. People's Education Press.
3. Confucius Institute Headquarters (Hanban). (2018). *Official examination papers of HSK (level 2)*. People Education Press.
4. Jiang, L. (2014). *Standard course HSK 2*. Language and Culture University Press.
5. Wang, X. (2015). *HSK 2 course book*. Sinolingua Press.
6. Yong, Y. M., & Kang, M. F. (2018). *Mandarin for all: book 2* (2<sup>nd</sup> edition). Penerbit Universiti Malaysia Pahang.

Course Code: UHF2121

Course: GERMAN FOR INTERMEDIATE

Pre-requisite: UHF1121 German for Beginners

#### Synopsis

This course is based on a communicative approach. They are expected to communicate accordingly in basic daily situations on topics such as living, leisure, employment etc. In addition, the basic elements of German grammar and all four skills (reading, listening, writing, speaking) are practiced. This course is defined in high CEFR A1 to low A2 levels.

#### Course Outcomes

- CO1 Recognise pronunciation of phrases and simple sentences from short recordings on familiar, everyday topics
- CO2 Identify information from short and simple texts on familiar, everyday subjects of immediate surroundings.

CO3 Describe topics of immediate surroundings in familiar, every context using simple sentences.

- CO4 Write a series of simple phrases and sentences linked with simple connectors on familiar, everyday subjects.

#### References

1. Deutsche, Welle. (2022). *Learn German*. <https://learngerman.dw.com/en/overview/>
2. Knirsch, M. & Verlag, M. V. (2010). *Hören and sprechen A1*. Verlag GmbH & Co. KG.
3. Niebisch, D., Penning-Hiemstra, S., Specht F., Bovermann, M. & Reimann, M. (2013). *Schritte international 1: deutsch als fremdsprache/kursbuch + arbeitsbuch*. Verlag GmbH & Co. KG. 2013.
4. Niebisch, D., Penning-Hiemstra, S., Specht F., Bovermann, M. & Reimann, M. (2013). *Schritte international 2: Deutsch als fremdsprache/kursbuch + arbeitsbuch*. Verlag GmbH & Co. KG.

Course Code: UHF2131

Course: JAPANESE FOR INTERMEDIATE  
Pre-requisite: UHF1131 Japanese for Beginners

#### Synopsis

The course aims to expose students to speak Japanese in related areas of most immediate relevance (e.g. travelling, family, foods and drinks). The students will continue to practice Japanese Phonetics. They will also learn additional selected words, common verbs and are expected to be able to write simple sentences. Classroom activities will focus on language skills practices in listening, speaking, reading and writing. The students will be evaluated based on the four language skills. The course is defined within the Common European Framework of References for Languages (CEFR) intermediate A1 to high A1.

Course Outcomes



- CO1 Recognise pronunciation of Japanese syllables, words and simple sentences from audio media or recording in related areas of most immediate relevance.
- CO2 Identify information related areas of most immediate relevance from simple texts
- CO3 Describe topics related areas of most immediate relevance using simple Japanese sentences
- CO4 Write words and simple sentences in Katakana and Hiragana related areas of most immediate relevance.

#### References

1. Mohd Iszuani Bin Mohd Hassan. (2021). *Iszuanihongo 1*. Penerbit Universiti Malaysia Pahang.
2. Syahrina binti Ahmad. (2018). *Rina jap. let's practice Japanese*. Penerbit Universiti Malaysia Pahang.

Course Code: UHF2141

Course: ARABIC FOR INTERMEDIATE

Pre-requisite: UHF1141 Arabic for Beginners

#### Synopsis

The course aims to expose students to speak Arabic in related areas of most immediate relevance (e.g asking for directions, hobbies, travelling, foods and drinks). Students will be given more opportunities to describe simple aspects of their everyday life in a series of simple sentences, using simple words/signs and basic phrases. They will also get opportunity to apply extensive written exercises enabling them to build up confidence in reading and writing vocalised Arabic text. The students will be evaluated based on the four language skills; listening, speaking, reading and writing. The course is defined within the Common European Framework of References for Languages (CEFR) intermediate A1 to high A1 level.

#### Course Outcomes

- CO1 Recognise pronunciation of phrases and simple sentences from audio

media and recordings in areas of most immediate relevance

- CO2 Identify information related to areas of most immediate relevance from simple texts.
- CO3 Describe topics related to areas of most immediate relevance using simple Arabic sentences
- CO4 Write simple phrases and sentences in Arabic in areas of most immediate relevance

#### References

1. Abu Sakeena Adnan Ishak. (2019). *Buku nota rujukan dan latihan bahasa arab KSSM tingkatan 4*. Modul Abu Sakeena
2. Che Radiah Mezah, Worhayuza Mohamad, Mohd Zaki Abd Rahman. (2014). *Kemahiran mengarang bahasa arab*. UPM
3. Haidar, O. (2013). *Arabic pronouns and prepositions*. McGraw-Hill Education.
4. Othman Bin Arifeen. (2013). *Cara mudah belajar bahasa arab buku (1-6)*. Al-Hidayah Publication
5. Wightwick, J. & Gaafar, M. (2013). *Arabic vocabulary*. McGraw-Hill Education.
6. Yasir bin Ismail Abas & Radziah binti Salleh. (2015). *Bahasa arab praktikal: nahu & sorof*. Taysir Arabia.
7. Zairul Mat Zain & Zulhisyam Mustapai. (2015). *Nahu mudah 2: teknik efektif belajar bahasa arab*. Telaga Biru.

Course Code: UHF2151

Course: SPANISH FOR INTERMEDIATE

Pre-requisite: UHF1151 Spanish for Beginners

#### Synopsis

The course aims to expose students to speak Spanish in related areas of most intermediate relevance (e.g. asking for directions, hobbies, travelling, leisure). Students will be given more opportunities to describe simple aspects of their everyday life in a series of simple sentences, using simple words/signs and basic phrases. They will also get opportunity to apply extensive written exercise enabling them to build up confidence in reading and writing

vocalised Spanish text. The students will be evaluated based on the four language skills: listening, speaking, reading and writing. The course is defined within the Common European Framework of References for Languages (CEFR) intermediate A1 to high A1 level.

#### Course Outcomes

- CO1 Recognise pronunciation of Spanish syllables, words and simple sentences from audio media or recording in related to areas of most immediate relevance.
- CO2 Identify information related to areas of most immediate relevance from simple texts
- CO3 Describe topics related to areas of most immediate relevance using simple Spanish sentences.
- CO4 Write words and simple sentences in Spanish related to areas of most immediate relevance

#### References

1. Azlina Mohd Ariffin. (2017). *Estudiar Espanol conmigo (level 2)*. Penerbit Universiti Malaysia Pahang.
2. Harvey, W. C. (2015). *Spanish every day* (2<sup>nd</sup> edition). Barron's Educational Series.
3. Richmond, D. (2015). *Basic Spanish*. McGraw-Hill Education.
4. Collins Dictionaries. (2016). *Collins Dictionary English to Spanish, Spanish to English* (4<sup>th</sup> edition). Harper Collins Publisher.

Course Code: UHF2192

Course: BAHASA MELAYU KOMUNIKASI

Pre-requisite: none

#### Synopsis

Kursus ini melatih pelajar antarabangsa untuk berkomunikasi dalam bahasa Melayu asas yang meliputi situasi kehidupan harian. Pelajar akan diperkenalkan dengan pertuturan dan penulisan bahasa Melayu mudah. Pengajaran dan pembelajaran akan

dilaksanakan dalam bentuk kuliah, tutorial, tugas dan pengalaman pembelajaran pelajar di dalam dan di luar kelas. Pada akhir kursus, pelajar diharapkan dapat berkomunikasi dan menulis menggunakan ayat mudah dengan berkesan berdasarkan CEFR iaitu A1 dan A2.

#### Course Outcomes

- CO1 Mengenalpasti huruf dan bunyi dalam bahasa Melayu dengan betul
- CO2 Mengenalpasti maksud teks ringkas tentang topik- topik dalam konteks harian menggunakan ayat mudah
- CO3 Berkomunikasi dengan menggunakan ayat mudah dalam pelbagai situasi
- CO4 Menulis karangan pendek dengan penyusunan idea secara sistematik.

#### References

1. Jamilah Bebe Binti Mohamad. (2017). *Modul Malay for intermediate*. Penerbit Universiti Malaysia Pahang.
2. Juwairiah Osman & Jamilah Bebe Mohamad. (2018). *Bahasa Melayu komunikasi*. Penerbit Universiti Malaysia Pahang.
3. Zarina Othman, Roosfa Hashim & Rusdi Abdullah. (2018). *Modul komunikasi bahasa melayu antarabangsa*. Penerbit Universiti Kebangsaan Malaysia.

## SINGLE DEGREE PROGRAMME

### FACULTY OF INDUSTRIAL MANAGEMENT (FIM) – BPE PROGRAM ONLY

Course Code: UHG2212

Course: GERMAN 1

Pre-requisite: none

#### Synopsis

This course enables the students to understand and use familiar everyday expressions at CEFR A1 level (Unit 1 -7) and very basic phrases aimed at the satisfaction of needs of a concrete type.

Students can introduce themselves and others and can ask and answer questions about personal details such as where they live, people they know and things they have. The students can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.

#### Course Outcomes

- CO1 Auditorily recognise simple sentences, familiar words that refer to her/himself, own family or concrete things around, when people speak slowly and clearly.
- CO2 Visually recognise familiar names, words and very basic phrases on simple notices in the most common everyday situations.
- CO3 Participate in interactions in a simple way, if the interlocutor is speaking slowly and clearly, and is prepared to help.
- CO4 Write a short simple postcard and fill in a hotel registration form

#### References

1. Bovermann, M., Niebisch, D., Penning-Hiemstra, S., Pude, A., Reimann, M., & Specht, F. (2019). *Schritte international NEU A1*. Hueber Verlag.
2. Evans, S., Pude, A., & Specht, F. (2012). *Menschen A1*. Hueber Verlag.
3. Dengler, S., Rusch, P., Schmitz, H., & Sieber, T. (2018). *Netzwerk A1*. Klettverlag.
4. Reimann, M. (2018). *Essential grammar of German*. Hueber Verlag.
5. Deutsche Welle. (2022). *News and current affairs from Germany and around the world*. Deutsche Welle. [www.dw.de/](http://www.dw.de/)
6. Schubert. (2022). *Schubert-verlag*. [www.schubert-verlag.de](http://www.schubert-verlag.de)
7. Mein-deutschbuch. (2022). *Deutsch lernerbei mein-deutschbuch.de*. [www.mein-deutschbuch.de](http://www.mein-deutschbuch.de)
8. Sprachen, E. K. (2022). *www.derdiedaf.com – alles rund um Ihren Deutschunterricht!* [www.derdiedaf.com](http://www.derdiedaf.com)

9. State of Victoria (2004). *German*. <https://www.education.vic.gov.au/languageonline/german/german.htm>
10. Goethe-Institut. (2022). *Goethe-Institut: sprache. kultur. deutschland*. [www.goethe.de](http://www.goethe.de)
11. Christiane Lemcke, Lutz Rohrmann: *Deutsch Grammatik Intensivtrainer NEU A1*. Klettverlag 2017.

Course Code: UHG2222

Course: GERMAN 2

Pre-requisite: UHG2212 GERMAN 1

#### Synopsis

This course enables the students to understand and use familiar everyday expressions at CEFR A1 level (Unit 8 -14) and very basic phrases aimed at the satisfaction of needs of a concrete type. Students can introduce themselves and others and can ask and answer questions about personal details such as where they live, people they know and things they have. The students can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.

#### Course Outcomes

- CO1 Auditorily recognise sentences and frequently used expressions related to areas of most immediate relevance
- CO2 Identify specific, predictable information in simple everyday material such as advertisement, manuals, reference lists and timetable
- CO3 Communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters
- CO4 Write in simple terms aspects of their background, immediate environment and matters in areas of immediate need

#### References

1. Bovermann, M., Niebisch, D., Penning-Hiemstra, S., Pude, A., Reimann, M., & Specht, F. (2019). *Schritte international NEU A1*. Hueber Verlag.

2. Evans, S., Pude, A., & Specht, F. (2012). *Menschen A1*. Hueber Verlag.
3. Dengler, S., Rusch, P., Schmitz, H., & Sieber, T. (2018). *Netzwerk A1*. Klettverlag.
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6. Schubert. (2022). *Schubert-verlag*. [www.schubert-verlag.de](http://www.schubert-verlag.de)
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8. Sprachen, E. K. (2022). *www.derdiedaf.com – alles rund um Ihren Deutschunterricht!* [www.derdiedaf.com](http://www.derdiedaf.com)
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11. Lemcke, C., & Rohrmann, L. (2017). *Deutsch grammatik intensivtrainer NEU: buch A1*. Klettverlag.

Course Code: UHG2232

Course: GERMAN 3

Pre-requisite: UHG2222 GERMAN 2

#### Synopsis

This course enables the students to understand simple sentences and frequently used expressions related to daily practices from Unit 1-7 (e.g. very basic personal and family information, shopping, local geography, employment, travelling, festivals, clothing, and German culture) at CEFR A2 level. The students can communicate in simple sentences and execute routine tasks requiring a simple and direct exchange of information on familiar matters. They can describe aspects of their background, immediate environment and matters in areas of immediate need in basic terms.

#### Course Outcomes

- CO1 Recognize frequently used expressions related to areas of most immediate relevance from audio texts
- CO2 Identify specific, predictable information in simple everyday material such as advertisement, manuals, reference lists and timetable
- CO3 Respond verbally in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters
- CO4 Write in simple terms aspects of their background, immediate environment and matters in areas of immediate need

#### References

1. Bovermann, M., Niebisch, D., Penning-Hiemstra, S., Pude, A., Reimann, M., & Specht, F. (2019). *Schritte international neu A2.1*. Hueber Verlag.
2. Bovermann, M., Niebisch, D., Penning-Hiemstra, S., Pude, A., Reimann, M., & Specht, F. (2019). *Schritte international neu A2.2*. Hueber Verlag.
3. Dengler, S., Rusch, P., Schmitz, H., & Sieber, T. (2019). *Netzwerk A2*. Klettverlag.
4. Deutsche Welle. (2022). *News and current affairs from Germany and around the world*. Deutsche Welle. [www.dw.de/](http://www.dw.de/)
5. Goethe-Institut. (2022). *Goethe-Institut: sprache. kultur. deutschland*. [www.goethe.de](http://www.goethe.de)
6. Lemcke, C., & Rohrmann, L. (2017). *Deutsch grammatik A2: intensivtrainer NEU*.
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11. State of Victoria (2004). *German*. <https://www.education.vic.gov.au/language/agesonline/german/german.htm>

Course Code: UHG2242  
 Course: GERMAN 4  
 Pre-requisite: UHG2232 GERMAN 3

#### Synopsis

This course enables the students to understand simple sentences and frequently used expressions related to daily practices from Unit 8 to 14 (e.g. very basic personal and family information, shopping, local geography, employment, travelling, festivals, clothing, and German culture) at CEFR A2 level. The students can communicate in simple sentences and execute routine tasks requiring a simple and direct exchange of information on familiar matters. They can describe aspects of their background, immediate environment and matters in areas of immediate need in basic terms.

#### Course Outcomes

- CO1 Recognize frequently used expressions related to areas of most immediate relevance from audio texts.
- CO2 Identify specific, predictable information in simple everyday material such as advertisement, manuals, reference lists and timetable
- CO3 Respond verbally in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters.
- CO4 Write in simple terms aspects of their background, immediate environment and matters in areas of immediate need

#### References

1. Bovermann, M., Niebisch, D., Penning-Hiemstra, S., Pude, A., Reimann, M., & Specht, F. (2019). *Schritte international neu A2.1*. Hueber Verlag.
2. Bovermann, M., Niebisch, D., Penning-Hiemstra, S., Pude, A., Reimann, M., & Specht, F. (2019). *Schritte international neu A2.2*. Hueber Verlag.
3. Dengler, S., Rusch, P., Schmitz, H., & Sieber, T. (2019). *Netzwerk A2*. Klettverlag.
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*around the world*. Deutsche Welle. [www.dw.de/](http://www.dw.de/)

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10. State of Victoria (2004). *German*. <https://www.education.vic.gov.au/languagesonline/german/german.htm>

#### DOUBLE DEGREE PROGRAMME

Faculty of Manufacturing & Mechatronic Engineering Technology and Faculty of Mechanical & Automotive Engineering Technology

Course Code: UHG2313/UHD2313

Course: GERMAN A1

Pre-requisite: None

#### Synopsis

This course enables the students to understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. Students can introduce themselves and others and can ask and answer questions about personal details such as where they live, people they know and things they have. The students can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.

#### Course Outcomes

- CO1 Recognise familiar words, phrases and sentences on familiar topics from audio texts.

- CO2 Identify familiar words and very basic phrases on simple notices in the most common everyday situations.
- CO3 Respond to conversations in a simple and routine task requiring a simple and direct exchange of information on familiar and routine matters.
- CO4 Write a short simple postcard and fill in a hotel registration form.

#### References

1. Bovermann, M., Niebisch, D., Penning-Hiemstra, S., Pude, A., Reimann, M., & Specht, F. (2019). *Schritte international NEU A1*. Hueber Verlag.
2. Dengler, S., Rusch, P., Schmitz, H., & Sieber, T. (2018). *Netzwerk A1*. Klettverlag.
3. Deutsche Welle. (2022). *News and current affairs from Germany and around the world*. Deutsche Welle. [www.dw.de/](http://www.dw.de/)
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6. Lemcke, C., & Rohrmann, L. (2017). *Deutsch grammatik intensivtrainer NEU: buch A1*. Klettverlag.
7. Mein-deutschbuch. (2022). *Deutsch lernerbei mein-deutschbuch.de*. [www.mein-deutschbuch.de](http://www.mein-deutschbuch.de)
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Course Code: UHG2323/UHD2323

Course: GERMAN A2

Pre-requisite: UHG2313/UHD2313  
GERMAN A1

#### Synopsis

This course enables the students to understand simple sentences and frequently used expressions related to daily practices (e.g. very basic personal and family information, shopping, local geography, employment, travelling, festivals, clothing, and German culture). The students can communicate in simple sentences and execute routine tasks requiring a simple and direct exchange of information on familiar matters. They can describe aspects of their background, immediate environment and matters in areas of immediate need in basic terms.

#### Course Outcomes

- CO1 Identify familiar words, phrases and sentences on familiar topics from audio texts.
- CO2 Recognise familiar words and very basic phrases on simple notices in the most common everyday situations.
- CO3 Respond to conversations in a simple and routine task requiring a simple and direct exchange of information on familiar and routine matters.
- CO4 Write a short text or email regarding holidays or celebration.

#### References

1. Bovermann, M., Niebisch, D., Penning-Hiemstra, S., Pude, A., Reimann, M., & Specht, F. (2019). *Schritte international NEU A1*. Hueber Verlag.
2. Dengler, S., Rusch, P., Schmitz, H., & Sieber, T. (2019). *Netzwerk A2*. Klettverlag.
3. Deutsche Welle. (2022). *News and current affairs from Germany and around the world*. Deutsche Welle. [www.dw.de/](http://www.dw.de/)
4. Goethe-Institut. (2022). *Goethe-Institut: sprache. kultur. deutschland*. [www.goethe.de](http://www.goethe.de)
5. Lemcke, C., & Rohrmann, L. (2017). *Deutsch grammatik A2: intensivtrainer NEU*. Klettverlag.
6. Mein-deutschbuch. (2022). *Deutsch lernerbei mein-deutschbuch.de*. [www.mein-deutschbuch.de](http://www.mein-deutschbuch.de)

7. Reimann, M. (2018). *Essential grammar of German*. Hueber Verlag.
8. Schubert. (2022). *Schubert-verlag*. [www.schubert-verlag.de](http://www.schubert-verlag.de)
9. Sprachen, E. K. (2022). *www.derdiedaf.com – alles rund um Ihren Deutschunterricht!* [www.derdiedaf.com](http://www.derdiedaf.com)
10. State of Victoria (2004). *German*. <https://www.education.vic.gov.au/languagesonline/german/german.htm>

Course Code: UHG2333/UHD2333

Course: GERMAN B1.1

Pre-requisite: UHG2323/UHD2323  
GERMAN A2

### Synopsis

This course is designed to pave the way for immediate B1 exam preparation in the following semester. The students will be exposed to various situations where they have to understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. They also need to deal with most situations likely to arise while travelling in an area where the language is spoken. The students will be guided to produce simple connected text on topics which are familiar or of personal interest and describe experiences and events, dreams, hopes and ambitions and briefly give reasons and explanations for opinions and plans. At the end of semester, the students should be able to understand, illustrate and describe their ideas, hopes and expectations on B1 level.

### Course Outcomes

- CO1 Recognize most auditive input, when near-standard register is used in everyday situations
- CO2 Perceive the main points of written input in standard register related to areas of most immediate relevance.
- CO3 Communicate in areas of daily relevance, e.g. personal information,

daily routine, work, spare time, future plans, etc.

- CO4 Write brief coherent texts about most familiar matters, as well as events, experiences and intentions.

### References

1. Bovermann, M., Niebisch, D., Penning-Hiemstra, S., Pude, A., Reimann, M., & Specht, F. (2019). *Schritte international neu B1*. Hueber Verlag.
2. Braun, B., Dengler, S., Fügert, N., & Hohmann, S. (2014). *Mittelpunkt neu B1+ deutsch als Fremdsprache für Fortgeschrittene*. Klettverlag.
3. Deutsche Welle. (2022). *News and current affairs from Germany and around the world*. Deutsche Welle. [www.dw.de/](http://www.dw.de/)
4. Goethe-Institut. (2022). *Goethe-Institut : sprache. kultur. deutschland*. [www.goethe.de](http://www.goethe.de)
5. Heering, A., Matussek, M., & Perlmann-Balme, M. (2002). *EM Übungsgrammatik*. Hueber Verlag.
6. Mein-deutschbuch. (2022). *Deutsch lerner bei mein-deutschbuch.de*. [www.mein-deutschbuch.de](http://www.mein-deutschbuch.de)
7. Ptak, M., & Schomer, M. (2017). *Grammatik intensivtrainer NEU B1*. Klettverlag.
8. Schubert. (2022). *Schubert-verlag*. [www.schubert-verlag.de](http://www.schubert-verlag.de)
9. Sprachen, E. K. (2022). *www.derdiedaf.com – alles rund um Ihren Deutschunterricht!* [www.derdiedaf.com](http://www.derdiedaf.com)
10. State of Victoria (2004). *German*. <https://www.education.vic.gov.au/languagesonline/german/german.htm>

Course Code: UHG2343/UHD2343

Course: GERMAN B1.2

Pre-requisite: UHG2333/UHD2333  
GERMAN B1.1

### Synopsis

This course enables the students to examine demanding, longer texts, and analyse meaning. They can express themselves fluently and spontaneously without much obvious searching for

expressions. The students are able to use language flexibly and effectively for social and professional purposes. Furthermore, they will be skillful enough to produce clear, well-structured texts on both abstract and concrete topics.

#### Course Outcomes

- CO1 Select straightforward factual information about common every day or job related topics from audio texts.
- CO2 Differentiate the main points and supporting details of standard input on familiar matters regularly encountered in work, school, leisure and others.
- CO3 Describe experiences and events, dreams and ambitions in discussions.
- CO4 Write simple connected text on topics that are familiar or of personal interest.

#### References

1. Bovermann, M., Niebisch, D., Penning-Hiemstra, S., Pude, A., Reimann, M., & Specht, F. (2019). *Schritte international NEU B1*. Hueber Verlag.
2. Braun, B., Dengler, S., Fügert, N., & Hohmann, S. (2014). *Mittelpunkt neu B1+ deutsch als Fremdsprache für fortgeschrittene*. Klettverlag.
3. Koithan, U., Mayr-Sieber, T., Schmitz, H., Sonntag, R., Losche, R., & Moritz, U. (2014). *Aspekte neu B1 plus*. Klettverlag.
4. Ptak, M., & Schomer, M. (2017). *Grammatik intensivtrainer NEU B1*. Klettverlag.

Course Code: UHG2353/UHD2353

Course: GERMAN B2.1

Pre-requisite: UHG2343/UHD2343  
GERMAN B1.2

#### Synopsis

This course enables the student to communicate as an independent user of German language on B2 level according to the Common European Framework of Reference for Languages (CEFR). Upon finishing the course, students will

understand the main ideas of complex texts on both concrete and abstract topics. They will be able to interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Students can produce clear, detailed texts on a wide range of subjects and explain a viewpoint on a topic giving the advantages and disadvantages of various options.

#### Course Outcomes

- CO1 Select main ideas from audio texts of lecture or/and interview on both concrete and abstract topics
- CO2 Differentiate the main points and supporting details of complex text on both concrete and abstract topics.
- CO3 Explain a standpoint on current issues fluently, accurately and effectively in interaction with native speakers without strain for either party.
- CO4 Justify a viewpoint on a topical issue, giving the advantages and disadvantages of various options in coherent written texts.

#### References

1. Daniels, A., Kohl-Kuhn, R., Mautsch, K. F., Sander, I., & Soares, H. T. (2016). *Mittelpunkt neu B2.1*. Klett Verlag
2. Ernst Klett Languages. (2022). *Deutsch als Fremdsprache*. <https://www.klett-sprachen.de/deutsch-als-fremdsprache/c-18>
3. Hantschel, H., Klotz, V., & Krieger, P. (2020). *Mit Erfolg zu telc deutsch b2 Übungsbuch + audio-cd*. Klettverlag.
4. Maenner, D. (2018). *Prüfungstraining daf: b2 - goethe-zertifikat b2 Übungsbuch*. Cornelsenverlag.
5. Perlmann-Balme, M., & Schwalb, S. (2014). *Sicher! B2*. Hueber Verlag.

Course Code: UHG2363/UHD2363

Course: GERMAN B2.2

Pre-requisite: UHG2353/UHD2353  
GERMAN B2.1



### Synopsis

This course is designed to complete German B2 level and furthermore serves as preparation for TELC B2 / Goethe-Zertifikat B2 exam. Upon finishing the course, students will understand the main ideas of complex texts on both concrete and abstract topics, will be able to interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Students can produce clear, detailed texts on a wide range of subjects and explain a viewpoint on a topic, giving the advantages and disadvantages of various options.

### Course Outcomes

- CO1 Select detailed instructions from audio texts of interviews on both concrete and abstract topics
- CO2 Differentiate main ideas and supporting details of advanced texts.
- CO3 Debate fluently and spontaneously without strain for either party
- CO4 Justify the advantages and disadvantages of various options on different subjects in a complex detailed written text

### References

1. Daniels, A., Kohl-Kuhn, R., Mautsch, K. F., Sander, I., & Soares, H. T. (2016). *Mittelpunkt neu B2.1*. Klett Verlag
2. Hantschel, H., Klotz, V., & Krieger, P. (2020). *Mit Erfolg zu telc deutsch b2 Übungsbuch + audio-cd*. Klettverlag.
3. Maenner, D. (2018). *Prüfungstraining daf: b2 - goethe-zertifikat b2 Übungsbuch*. Cornelsenverlag.
4. Perlmann-Balme, M., & Schwalb, S. (2014). *Sicher! B2*. Hueber Verlag.

## ELECTIVE COURSES

Course Code: UHE3022

Course: CRITICAL THINKING THROUGH LITERATURE

Pre-requisite: none

### Synopsis

The course aims to use literature as a subject matter that will be explored through the use of various activities which engage students' critical thinking skills. It will introduce representative literary genres: poetry, short story, popular culture, drama/play. This course is suitable for students who are interested in literature and in developing strong critical thinking skills as it guides students toward a greater understanding and appreciation of literature in connection with their own lives. The course is defined within the CEFR low C1 to high C1 level.

### Course Outcomes

- CO1 interpret a poem critically using relevant literary elements and appropriate language.
- CO2 write a short story demonstrating critical understanding of literary principles by incorporating relevant elements of fictional prose.
- CO3 deliver a critical analysis of the history of music.
- CO4 produce a radio drama demonstrating critical understanding of literary principles by incorporating relevant elements of an audio broadcast.

### References

1. Sharmila Narayanasamy, Wong, S. N., Priyadarshini Tinagharan, Marita Mohamed Noor. (2018). *Critical Thinking*. Oxford University Press.
2. Poplawski, P. (2017). *English Literature in Context*. (2<sup>nd</sup> revised ed) Cambridge University Press.
3. Van Cleave, M. (2016). *Introduction to Logic and Critical Thinking*. Matthew J. Van Cleave Publication.
4. Usher, S. (2015). *Lists of Note: An Eclectic Collection Deserving of a Wider Audience*. Chronicle Books.

Course Code: UHE3082

Code: CREATIVE WRITING

Pre-requisite: none

### Synopsis

This course aims to foster a better understanding of the craft of writing and to

instill an appreciation of what goes into producing readable, publishable, and engrossing fiction. It encourages the integral first steps towards writing creatively by tapping students' writing potentials to write clearly with imagination. It also exposes students to the beauty of written language and the mechanics of descriptive writing using figurative language and critical thinking skills. Students will explore the creative process through writing, expand and refine vocabulary and style resources, analyse a piece of writing, reinforce process writing, delve into radio play writing and producing a radio drama. This course is defined within the CEFR high B2 to low C1 level.

#### Course Outcomes

- CO1 Compose a weekly journal on your personal blog using accurate language and literary devices.
- CO2 Analyse and construct a creative piece of writing based on a picture /situation using accurate language and appropriate content.
- CO3 Create a drama script using accurate figurative language and appropriate content.
- CO4 Produce and dramatised a script for radio drama.

#### References

1. Bair, A. L. (2019). *Blogging for Dummies*. Hoboken. John Wiley & Sons.
2. Bond, S. (2015). *Your Personal Fiction Writing Coach: 365 Days of Motivation & Tips to Write a Great Book*. NeedtoRead Books.
3. Cecelia Turner (2012). *The Blog & The Journal\_writing about you*. Ruksak Books.
4. Cook, T. (2020). *Writing Audio Drama: Radio, Film, Theatre and Other Media*. Taylor & Francis.
5. Falcon, L. A. (2020) *Write Your Short Story: 101 Ideas for Short Story Writing*.
6. Goodman, R. (2017). *The Soul of Creative Writing*. Routledge.
7. Harper, G. (2020). *Discovering Creative Writing*. Multilingual Matters.

Course Code: UHE3092

Course: ENGLISH MECHANICS

Pre-requisite: none

#### Synopsis

The course primarily aims to develop a greater understanding of the English mechanics which includes grammar, sentence structure, word formation and order, spelling, capitalisation and punctuation. Students will be exposed to these aspects in language to strengthen their written communication skills. The course is defined within the CEFR high B1 and high B2 levels.

#### Course Outcomes

- CO1 Identify elements of writing mechanics in English language according to selected writing convention(s).
- CO2 Identify and analyze the use of writing mechanics in English language.
- CO3 Write an essay using correct mechanics in English language according to a selected writing convention.

#### References

1. American Psychological Association. (2020). *Publication Manual of the American Psychological Association*. Seventh Edition. American Psychological Association.
2. American Psychological Association. (2013). *Publication Manual of the American Psychological Association*. Sixth Edition. American Psychological Association.
3. Casagrande, J. (2014). *The Best Punctuation Book, Period: A Comprehensive Guide for Every Writer, Editor, Student and Businessperson*. Ten Speed Press.
4. Hatala, M. (2020). *APA Simplified: Your Concise Guide to the 7<sup>th</sup> Edition*. Greentop Academic Press.
5. Moriarty, M. F. (1997). *Writing Science Through Critical Thinking*. Hollins Digital Common.
6. Strauss, J. Kaufman, L., & Stern, T. (2014). *The Blue Book of Grammar and Punctuation: An Easy-to-Use Guide with Clear Rules, Real-World Examples and Reproducible Quizzes*. 11<sup>th</sup> Edition. Wiley.

7. Young, D. J. (2008). *The Mechanics of Writing: Which Comes First, the Comma or the Pause?* Writer's Toolkit Publishing, LLC.

Course Code: UHE3132  
 Course: PUBLIC SPEAKING  
 Pre-requisite: none

#### Synopsis

The course aims to introduce students to the speech planning process. Students will be exposed to two types of public speaking, namely informative and persuasive speeches. Students will learn how to select a topic, gather materials and supporting points, organise the body of the speech, prepare an outline and deliver the speech. Videos on speeches will be used to provide samples on effective delivery skills. Students will also be exposed to the use of relevant technology in preparing and delivering their speeches creatively and effectively. The course is defined within the CEFR high B1 to high B2 level.

#### Course Outcomes

- CO1 apply the fundamentals of public speaking in analyzing and performing public speeches.
- CO2 present a persuasive speech based on the prepared speech outline by applying effective delivery strategies and appropriate language style.
- CO3 present an informative speech based on the prepared speech outline by applying effective delivery strategies and appropriate language style.

#### References

1. Carnegie, D. (2017). *How to develop self-confidence and influence people by public speaking.* Simon and Schuster.
2. Carnegie, D. (2018). *The Art of Public Speaking: The Original Tool for Improving Public Oration.* Skyhorse Publishing.
3. Dwyer, K.K. (2020). *I Conquer Speech Anxiety: A Workbook to Help You Overcome Your Nervousness About Public Speaking.* Kld Books, Inc.

4. Fujishin, R. (2016). *The Natural Speaker.* Routledge.
5. Gallo, C. (2019). *Talk Like TED: The 9 Public Speaking Secrets of the World's Top Minds.* Pan Macmillan.
6. Sprague, J., Stuart, D., & Bodary, D. (2018). *The Speaker's Handbook.* Cengage Learning.

Course Code: UHE3142  
 Course: PROJECT BASED PROPOSAL WRITING  
 Pre-requisite: none

#### Synopsis

The course is designed to develop students' ability in writing a project-based proposal with regard to their final year undergraduate research project (URP) or Projek Sarjana Muda (PSM). Students are facilitated in composing a title, an abstract, Introduction, Literature Review and Methodology sections of a project proposal. The emphasis is on academic writing conventions and skills where grammar is implicitly embedded into the process. Elements of citation techniques and referencing are taught to develop students' awareness about the risks of plagiarism. Additionally, Gantt charts are taught to assist students in their project planning and scheduling. The course is defined within the CEFR B1 to high B2.

#### Course Outcomes

- CO1 Synthesise research articles based on a objective of writing a project-based proposal.
- CO2 Compose an introductory and literature review section of a project-based proposal.
- CO3 Produce a complete proposal with an abstract, references and a work schedule of a project-based proposal.
- CO4 Present a complete proposal via oral presentation using appropriate skills, language and delivery styles defend.

#### References

1. Birley, G., & Moreland, N. (2014). *A practical guide to academic research.* Routledge.

2. Hafizoah Kassim, Noor Raha Mohd Radzuan, Nor Yazid Khamis, Zarina Mohd Ali & Zuraina Ali. (2014). No Plagiarism!. Penerbit UMP.
3. McGregor, S. L. (2017). Understanding and evaluating research: A critical guide. SAGE Publications.
4. Punch, K. (2000). Developing effective research proposals. Sage.
5. Style, B. A. (2020). APA 7<sup>th</sup> Editio Guide. Retrieved from <http://www.fanshawelibrary.com/wp-content/uploads/2020/09/APA-7th-Edition-LLC-2020.pdf>

Course Code: UHE3152

Course: INTERPERSONAL EFFECTIVENESS

Pre-requisite: UHL2412 English For Academic Communication

#### Synopsis

This course is specifically designed for students who wish to improve their ability to interact with others in their personal and professional lives. The course begins with a focus on preliminary topics such as basics of interpersonal communication and the process of communication. The second part of the course includes intrapersonal topics such as self-awareness, self-disclosure, trust, and self management. The final part of the course covers interpersonal topics such as perception, diversity, active listening, feedback, and communication apprehension. The teaching and learning approach used in this course includes interactive lectures, small group activities, video analysis, and role playing. This course is defined within the CEFR high B2 to low C1 level.

#### Course Outcomes

- CO1 Demonstrate knowledge and understanding of the fundamental principles of intrapersonal and interpersonal themes.
- CO2 Express self-reflection based on six stimulus questions given.
- CO3 Evaluate four key points on selected interpersonal topics using appropriate delivery strategies.

CO4 Develop a 15-minute role play incorporating a minimum of three aspects of intrapersonal and interpersonal themes learnt throughout the semester.

#### References

1. Beebe, S. A., Beebe, S. J. and Ivy, D. K. (2016). Communication Principles for a Lifetime (6th ed.) Pearson Education.
2. DeVito, J. A. (2016). The Interpersonal Communication Book (14th ed.) Pearson Education Limited.

Course Code: UHE3512

Course: CONVERSATIONAL ARABIC FOR TOURISM

Pre-requisite: none

#### Synopsis

The main aim of this course is to enhance students' knowledge in specific Purposes' knowledge in specific Purposes' (tourism) fields. Students will learn 300 words for conversation related to tourism purposes. The learning process will be through words, phrases and texts, and expressions. This include Arabic websites as well as the trainer's supplementary materials. Audio and visual aids will be used to enhance the students speaking skills.

#### Course Outcomes

- CO1 Identify accurately word and signage in Arabic.
- CO2 Produce correct sentences in Arabic conversation for tourism purposes
- CO3 Enunciate proper diction for Arabic phrases

#### References

1. Pyezan, S., & Gan, Y.K. (2019). *Cara mudah belajar bahasa arab*. Prestasi Publication Enterprise.

2. Madinah Arabic FZE. (2020). *Learn Arabic with Madinah Arabic* [www.madinaharabic.com](http://www.madinaharabic.com)
3. Mardhiyyah Zamani, Mohammad Baihaqi Hasni, Rosjuliana Hidayu Rosli, Farah Hanan Aminallah. (2019). *Arabic for beginner*. Penerbit UMP.
4. Marzuki Yaakob & Abdul Hadi Mohd Salleh. (2014). *At-taujih fil' Arabiyyah al-ittisaliyyah*. UiTM Shah Alam.
5. Mohammad Baihaqi Hasni, Mardhiyyah Zamani, Rosjuliana Hidayu Rosli, Farah Hanan Aminallah. (2019). *Arabic for intermediate*. Penerbit UMP.

Course Code: UHE3612  
Course: BAHASA MELAYU  
DOKUMENTASI  
Pre-requisite: none

#### Synopsis

Kursus ini akan memperkenalkan dan memberi kefahaman kepada pelajar tentang konsep dokumentasi rasmi surat menyurat yang melibatkan pelbagai jenis surat dan format yang terdapat di dalam bahasa Melayu. Seterusnya kaedah penulisan dokumentasi tidak rasmi dan email serta penyediaan laporan juga diberikan penekanan dalam kursus ini. Secara dasarnya pentaksiran ketiga-tiga modul adalah berbentuk penyelesaian masalah berdasarkan analisis keperluan khusus. Kursus ini merangkumi tahap CEFR diantara B2 ke C1.

#### Course Outcomes

- CO1 Menghasilkan dokumentasi surat - menyurat menggunakan format dan gaya bahasa yang sesuai.
- CO2 Menyampaikan maklumat yang relevan semasa mesyuarat dan dalam bentuk dokumentasi mesyuarat.
- CO3 Menghasilkan laporan menggunakan format dan gaya bahasa yang sesuai.

#### References

1. Abdul Rashid Melebek & Amat Juhari Moain. (2011). *Sejarah bahasa melayu*. Utusan Publications & Distributors Sdn. Bhd.
2. Dewan Bahasa dan Pustaka. (2017). *Modul asas tatabahasa dan asas penulisan dokumen rasmi*. Dewan Bahasa dan Pustaka
3. Hasnah Mohd Saleh, Normah Mohamad, & Isnariah Ismail. (2019). *Penulisan memo dan minit mesyuarat*. Sasbadi.
4. Maryam Azlan, Mujahid Bakar, Rohani Ismail, & Nurhidanatasha Abu Bakar. (2018) *Panduan penulisan akademik*. Penerbit Universiti Sains Malaysia.
5. Samsudin Wahab. (2017). *Surat, minit mesyuarat, dokumen peniagaan dan laporan*. PTS Professional.



# **CENTRE FOR HUMAN SCIENCES**

**COURSE INFORMATION 2022-2023**

## CURRICULUM STRUCTURE FOR HUMAN SCIENCES DEPARTMENT

BIL	COURSE CODE	COURSE
<b>HUMAN SCIENCES DEPARTMENT</b>		
1	UHC 1012	Falsafah & Isu Semasa
2	UHC 2022	Penghayatan Etika & Peradaban
<b>SOFT SKILLS DEPARTMENT</b>		
1	UHS 1022	Soft Skills
<b>ELECTIVE COURSES</b>		
1	UHE3012	Contemporary Leadership in Community
2	UHE 3032	Introduction to Human Behavior
3	UHE3042	Organizational Counseling
4	UHE 3062	Malaysia: The Impact of Globalization
5	UHE 3072	Technology for Human Capital Development
6	UHE 3122	Islamic Institutions
7	UHE 3162	Family System in Islam
8	UHE 3182	Malaysian Studies
9	UHE 3192	Fundamental Ibadah In Islam
10	UHE 3202	Introduction to Halal Studies
11	UHE 3212	Global Competencies
12	UHE 3222	Al-Quran Memorization 1
13	UHE 3232	Al-Quran Memorization 2
14	UHE 3242	Fiqh Haji and Umrah
15	UHE 3252	Positive Psychology
16	UHE3262	Foundation in Foundation in Technical and Vocational Education and Training (TVET)
17	UHE3272	Introduction to Social Science
18	UHE3282	Palestine Studies
19	UHE3292	Introduction to Islamic Astronomy
20	UHE3302	Introduction to Political Science
21	UHE3312	Introduction to International Law
22	UHE3322	Introduction to Islamic Medication Practice
23	UHE3332	Zikir (Islamic Remembrance) For Human Development
24	UHE 3342	Strategic Thinking of Iconic Asian Leaders

25	UHE3352	Introduction to Principles of Islamic Jurisprudence
26	UHE3362	Instructional Design and Technology In TVET
27	UHE3372	Complex Problems Solving Skills
28	UHE3382	Arabic Corpus 1
29	UHE3392	I'jaz Al Quran
30	UHE3402	Psychology in the Quran & Sunnah
31	UHE3412	Leadership in Tvet
32	UHE3422	Introduction to Industrial and Organizational Psychology
33	UHE3432	Kursus Integriti Dan Anti-Rasuah (KIAR)
34	UHE3442	Introduction to Training Management
35	UHE3452	Introduction to Guidance and Counseling



## COURSE SYNOPSIS HUMAN SCIENCES DEPARTMENT

Degree and Diploma

Course code: UHC1012

Course: FALSAFAH & ISU SEMASA

Pre-requisite: none

### Synopsis

This course covers the association between Philosophy, National Education Philosophy, and Rukun Negara (National Pillars). The art of logical reasoning and the concept of humans in this Philosophy course will enhance thinking skills while simultaneously cultivating good values and behaviors. This course allows students the opportunity to discuss current issues relating to Epistemology, Metaphysics, and Ethics. Furthermore, this course emphasizes Philosophy to promote cross-cultural dialogues and increase common values between students. By the end of this course, students will be able to identify the disciplines of knowledge comprehensively and integratively.

### Course Outcomes

CO1 Explain current issues of Philosophy, National Education Philosophy, and Rukun Negara (National Pillars).  
CO2 Elaborate on current issues according to the mainstream of thought in various schools of Philosophy.  
CO3 Analyze current issues from the perspective of the comparative philosophies to promote cross-cultural dialogues.

### References

1. Al-Attas, S. M. Naquib. (1991). The Concept of Education in Islam. Kuala Lumpur: ISTAC
2. Al-Farugi, I.R. (1994). Al-Tawhid: Its Implications for Thought and Life (2nd Ed.). Herndon: IIIT.
3. Phillips, D. C. (Ed.) (2014). Encyclopaedia of Educational Theory and Philosophy (1st Ed.). SAGE Publication
4. Dzulkifli, A. R. & Rosnani, H. (2019) Pentafsiran Baharu Falsafah Pendidikan

Kebangsaan dan Pelaksanaannya Pasca 2020. Kuala Lumpur: IIUM Press.

5. Hospers, J. (1997). An Introduction to Philosophical Analysis (4th Ed.). London: Routledge.
- Mitchell, H.B. (2011). Roots of wisdom: A Tapestry of Philosophical Traditions (6th Ed.). Wadsworth: Cengage Learning.
6. Osman Bakar (1999) The Classification of Knowledge in Islam. Cambridge, U.K.: The Islamic Texts Society.
7. Rosnani Hashim (2017). Revitalization of Philosophy and Philosophical Inquiry in Muslim Education. Kull of Education, IIUM.
8. Solomon, R.C. & Higgins, K.M. (2010). The Big Questions: A Short Introduction to Philosophy (8th Ed.). Wadsworth: Cengage Learning.
9. Weiming, T. & Ikeda, D. (2011). New Horizons In Eastern Humanism: Buddhism, Confucianism and The Quest for Global Peace. London: I. B.Tauris.

Course code : UHC2022

Course : PENGHAYATAN ETIKA & PERADABAN

Pre-requisite : none

### Synopsis

This course explains the ethical concepts from different civilizational perspectives. It aims to identify the systems, growth stages, developments and cultures across the races in strengthening the social cohesion. Furthermore, the discussions and debates on contemporary issues in the economic, politic, social, cultural and environment from ethical and civilizational perspectives will enhance the morale and professionalism among students. The High Impact Educational Practises (HIEPs) relevant approach will be applied in the course delivery. At the end of this course, the students will be able to correlate the ethics and civic-minded citizenship.

### Course Outcomes

- CO1 Explain the ethical concept from different civilizations.  
CO2 Compare the systems, development stages, social advancements and cultures beyond race.

CO3 Discuss contemporary issues on economy, politic, social, culture and environment based on ethical perspectives and civilizations.

#### References

1. Shamsul Amri Baharuddin, Modul Hubungan Etnik, Edisi Kedua, Institut Kajian Etnik, Universiti Kebangsaan Malaysia, Bangi 2012.
2. Mohd Rizal Yaakop, Shamrahayu A. Aziz, Kontrak Sosial, Perlembagaan Persekutuan 1957: Pengikat Jati Diri Bangsa Malaysia Merdeka, Institut Terjemahan & Buku Malaysia, Kuala Lumpur, 2014.
3. Perlembagaan Persekutuan hingga 5 Februari 2014, International Book Laws, Petaling Jaya, 2014.
4. Esa Khalid, Mohd Azhar Abd. Hamid, Beberapa Aspek Tamadun Melayu, India, China dan Jepun, Penerbit UTM, 2004.
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6. Jennifer Gunning and Soren Holm, Ethics, Law and Society, Aldershot:Ashgate, 2007.
7. Mariam Al-Attar, Islamic Ethics: Divine Command Theory in Arabo-Islamic Thought, Abingdon, Oxon: Routledge, 2010.
8. Michael J. Quinn, Ethics for the Information Age, Boston: Pearson/Addison-Wesley, 2006.

## **COURSE SYNOPSIS**

### **SOCIAL SCIENCES DEPARTMENT**

Degree and Diploma  
Course code : UHS1022  
Course : SOFT SKILLS  
Pre-requisite: none

#### Synopsis

This course exposes students to Kemahiran Insaniah which are non-job specific skills that are important in personality development. This course aims to develop holistic students with sense of awareness, good manners and responsible in self-management, social relationships with others and society and also the environment. It focuses on spiritual, emotional, leadership and team working, lifelong learning, integrity, adab and akhlak, critical thinking and problem solving using an integrated approach in developing balance, well-mannered and well-rounded personalities. In the end, students will be more spiritually, emotionally, intellectually and socially resilient to face any challenges in their life.

#### Course Outcomes

CO1 Recognize positive values as a leader .  
CO2 Organize diversified information to solve problem sustainably as a leader .  
CO3 Perform effective leadership attributes.

#### References

1. Barun K. Mitra (2011). Personality Development And Soft Skills. New Delhi : Oxford University Press [HF5718 .M58 2011]9.
2. Rohana Hamzah & Zuraina Ali (2017). Kecerdasan Spiritual; Modul Pendekatan Pendidikan Integrasi Holistik. Kuantan: Penerbit UMP Press. 8.
3. Modul Pembangunan Soft Skills (Kemahiran Insaniah) Untuk Institusi Pengajian Tinggi Malaysia (2010). Serdang, Selangor : Penerbit UPM [LC1037.4.M4 M63 2010]
4. Johari Alias (2003) Mencari Kesempurnaan Pekerti . Kuala Lumpur : Dewan Bahasa Dan Pustaka. [BP188 .J64 2003]
5. Lee Gardenswartz, Jorge Cherbosque, Anita Rowe (2008). Emotional Intelligence For Managing Results In A Diverse World: The Hard Truth About Soft Skills In The Workplace. Mountain View, Ca: Davies-Black Pub [HF5549.5.M5 G37 2008]
6. (2005). Panduan Program Soft Skills untuk Pelajar. Penerbit KUKTEM: Kuantan

## ELECTIVE COURSES

Course code : UHE3012  
 Course : CONTEMPORARY LEADERSHIP  
 IN COMMUNITY  
 Pre-requisite : none

### Synopsis

This course explores the basic concept of leadership and ways of being a good leader. It includes the theoretical and practical aspects of leadership as well as issues related to contemporary leadership in community. In general, the philosophy of the course is to equip students with knowledge and skills of good leadership.

### Course Outcomes

- CO1 Identify the nature and concept of leadership
- CO2 Explain and demonstrate the characteristics of good leadership
- CO3 Analyse the current issues of good leadership and demonstrate the values and skills of effective leadership

### References

1. Dent, F. E. (2014) The Leadership Pocketbook. London: Management Pocketbooks Limited
2. Yukl, G.A. (2020) Leadership in Organizations: Fifth Edition, Upper Saddle River, NJ, Prentice-Hall.
3. Covey, S. (2012). Principle-Centred Leadership. New York: Summit Books
4. Hart, M.O. (2000). The 100: A ranking of the most influential persons in history. New York: Hart Publishing Company Inc
5. Hisham al Talib. (2016) Training guide for Islamic workers. A Simon & Schuster Company. The International Institute of Islamic Thought, USA

Course code : UHE3032  
 Course : INTRODUCTION TO HUMAN  
 BEHAVIOR  
 Pre-requisite : none

### Synopsis

This course is designed to expose students to the basic concepts and major aspects of psychology that related to human behavior. It discusses the part of human being (physical, mental, spiritual and emotion) from various perspectives. It also emphasizes on the application of psychology in diverse human activities. In general, the philosophy of this course is to provide students with correct ways of understanding their behaviour as well as others.

### Course Outcomes

- CO1 To explain the concept related to human behavior in human activities.
- CO2 To apply the principles of psychology in dealing with the issues related to human behaviour through project.
- CO3 To analyze issues related to human behaviour.

### References

1. Akbar Hussin, et al. (eds). (2008). Horizons of Spiritual Psychology. 1st ed. New Delhi, India, Global Vision Publishing House.
2. Baron, R.A. (1995). Psychology. 3rd ed. USA: Ally & Bacon
3. Lilienfeld, S.O., Lynn, S.J., Namy, L.L., & Woolf, N.J. (2009). Psychology: From Inquiry to Understanding. USA: Pearson Education, Inc.
4. Kaplan, R.M. & Saccuzzo, D.P. (2001). Psychological testing: principles, applications and issues. 5th Ed. Pacific Grove, California: Wadsworth/Thomson Learning, Inc
5. Noraini M. Noor (Ed.). (2009). Psychology from an Islamic Perspective: A Guide to Teaching and Learning. 1st ed. Kuala Lumpur: International Islamic University Malaysia Press, IIUM.

Course code : UHE3042  
 Course : ORGANIZATIONAL COUNSELING  
 Pre-requisite : none

### Synopsis

This course will discuss the theoretical and application of counselling in the work setting. It covers the basic framework of counselling skills, techniques and process of counselling

dealing with workplace issues. This course also discusses related personality theories, common problems in the workplace and ways to deal with them. In general, the philosophy of this course is to expose students to the knowledge and basic counselling skills related to workplace in an organization.

#### Course Outcomes

- CO1 Identify the concept, principles and issues related to counselling in organization.
- CO2 Demonstrate the ability to employ basic counselling skills and techniques in helping clients.
- CO3 Adopt the values and principles of counselling in dealing with self and others.

#### References

1. Amir Awang. (1987). Teori dan amalan psikoterapi. Pulau Pinang: Penerbitan USM
2. Bahagian Perkhidmatan Psikologi, Jabatan Perkhidmatan Awam Malaysia. (t.t). Kaunseling Organisasi: Satu Pengenalan. Putrajaya: Penerbit Kelab Kebajikan Bahagian Perkhidmatan Psikologi (KEPSI).
3. Carroll, M. (1996). Workplace counselling: a systematic approach to employee care. 1st ed. London, UK: Sage Publications Ltd
4. Corey, Gerald. (2009). Theory and Practice of Counseling and Psychotherapy. 8th ed. USA: Thomson Brooks/Cole
5. Hamdan Abd. Kadir. (2009). Kaunseling di tempat kerja. Edisi 1. Skudai Johor: Penerbit Universiti Teknologi Malaysia

Course code : UHE3062

Course : MALAYSIA: THE IMPACT OF GLOBALIZATION

Pre-requisite : none

#### Synopsis

This course discusses the influence and impact of globalization on Malaysia and international relations. The influence highlighted will be in the perspective of politics, economics, social and culture. The contemporary issues and challenges related to the globalizational impact in Malaysia and

other countries are also discussed. In general, the philosophy of the course is to facilitate borderless thinking among the students about the globalization impact towards human and environmental aspects

#### Course Outcomes

- CO1 Identify the concept of globalization in terms of its working definition, key features, and perspectives.
- CO2 Explain the Malaysia involvement and reactions towards the globalization impact in various aspects of life.
- CO3 Analyze contemporary issues and challenges of globalization across national and international boundaries.

#### References

1. Abdul Ghafur Hamid. 2011. Public international Law: A Practical Approach. Thomson Reuters Malaysia.
2. Jamaluddin Hj. Ahmad Damanhuri, Zulkurnain Hj. Awang, Sarojini Naidu (ed.,). (2003). Globalisation Meeting Future Challenges, INTAN
3. Karl W. Deutsch, Murugesu Pathmanathan (terj). (1995). Analisis Perhubungan Antarabangsa. Kuala Lumpur: Dewan Bahasa dan Pustaka
4. M. Bakri Musa. (2002). Malaysia In The Era of Globalization. United States of America
5. Norani Othman, Sumit K. Mandal (ed), (2000). Malaysia Menangani Globalisasi (Peserta atau Mangsa). Bangi, Selangor: Penerbit Universiti Kebangsaan Malaysia
6. Scott R.Sernau. 2008. Contemporary Readings in Globalization. United State, Sage Publications Ltd.
7. Zuhilmi Paidi & Asrar Omar. (2003). Hubungan Luar Antarabangsa. Kuala Lumpur: PTS Publications & Distributors Sdn. Bhd

Course code : UHE3072

Course : TECHNOLOGY FOR HUMAN CAPITAL DEVELOPMENT

Pre-requisite: none

## Synopsis

This course will enable students to understand the concept and process of human capital development and technology in the industry. They will learn the uses of training needs analysis, information technology, and biofeedback techniques in the human development programs. This will also cover several technologies in human development such as personality profiling, program design, basic quantitative and qualitative design, data analysis, heart rate variability, skin conductance biofeedback systems, biofeedback script, and protocol. The uses of technology and human development theory are integral in providing a hands-on approach to students in designing and implementing human capital development activities.

## Course Outcomes

- CO1 Recognize the concept and process of human capital development.
- CO2 Analyze and integrate technology and human capital development.
- CO3 Apply the uses of technology in human capital development.

## References

1. Muhammad Nubli (2008), Modul Meningkatkan Prestasi Diri, Universiti Malaysia Pahang.
2. Muhammad Nubli (2008), Pembangunan Insan Pendekatan Personaliti Kontemporari, Universiti Malaysia Pahang.
3. Mark S. Schwartz (2005), Biofeedback, Second Edition: A Practitioner's Guide, New York: The Guilford Press.
4. John T. Cacioppo (2007), Handbook of Psychophysiology, Cambridge University Press.
5. Raymond A. Noe (2008) Employee training and development, McGraw-Hill.
6. Bray Tony, The training design manual: the complete practical guide to creating effective and successful training programmes. Kogan
7. Kenneth G. Brown (2017), The Cambridge handbook of workplace training and employee development, Cambridge University Press

Course code : UHE3122  
 Course : ISLAMIC INSTITUTIONS  
 Prerequisite : none

## Synopsis

This course is designed to equip students with a deeper understanding on the basic functions of institutions such as values, ethics, objectives, sources, tools, characteristics and other management principles and concepts. This subject will expose the students to the managerial approaches pertinent in education, social, judicial, legislative, political, banking, zakat, takaful, sports, halal institutions and several management issues are also covered. In general, the philosophy of the course is to develop students to become more knowledgeable on managerial duties, skills, roles and decisions.

## Course Outcomes

- CO1 Explain the concept, principles, sources and values in managing institutions
- CO2: Identify the philosophy and characteristics of Islamic institutions
- CO3: Apply the Islamic ethics in managing activities in a daily life.

## References

1. Hassan Ahmad (Ed). (2008). Institusi Institusi Islam. Kuantan, Pahang: Penerbit UMP.
2. Muhammad Nubli Abdul Wahab.(2008). Siri Kecemerlangan Pengurusan Organisasi dalam Islam 1. Kuantan, Pahang: Penerbit UMP.
3. Muhammad Nubli Abdul Wahab. (2009). Pembangunan Insan: Pendekatan Personaliti Kontemporari. Kuantan, Pahang: Penerbit UMP.
4. Khaliq Ahmad, Rafikul Islam, Yusof Ismail (2012).Issues in Islamic Management; Theories and Practices. IIUM: Gombak.
5. UmmeSalma Mujtaba Husein (2014). Management and Islamic Countries: Principle and Practice.New York:Businesss Expert Press.
6. Ali Abbas (2005).Islamic Perspective on Management and Organization. Cheltenham, UK ; Northampton, MA : Edward Elgar Pub.

7. Abdul Ghani Azmi Idris (1997) *Mengenal Qanun Jenayah Islam*. Kuala Lumpur: Pustaka Al Hidayah.
8. Surtahman Kastin Hasan (1990) *Ekonomi Islam*. Bangi, Selangor: Universiti Kebangsaan Malaysia.

Course code : UHE3162  
 Course : FAMILY SYSTEM IN ISLAM  
 Pre-requisite : none

#### Synopsis

This course is designed to equip students with a deeper understanding of basic family management in Islam. It covers the concept of marriage in Islam including pre and post marriage management and laws according to Imam Shafie school of thought. However, a comparative mazahib (school of thoughts) discussion will also be covered in certain issues as well as contemporary local laws. The course also discusses contemporary issues that are related to this topic such as gamophobia, rulings on foster child and others.

#### Course Outcomes

- CO1 Explain the values of Islamic family system in the task given.  
 CO2 Analyze Islamic family system of marriage.  
 CO3 Evaluate Islamic family system of marriage to overcome related issues.

#### References

1. Al Jaziri, Abd Rahman. (1990). *Kitab al Fiqh ala Mazahib al Arbaah*. Beirut: Dar al Kutub al Ilmiyyah.
2. Al Qardawi, Yusuf. (2005 ). *Fatawa Muasirah*. Cetakan ke 5 Al Qahirah: Dar al Qalam.
3. Al-Zuhaili, Wahbah. (1989). *Al-Fiqh al-Islami wa Adillatuh*. Cetakan ke-4. Beirut: Dar al-Fikr.
4. Mustafa Khin, Mustafa al Bugha & Ali al Syarbaji, (terj. Zulkifli Mohamad) (2009). *Al Fiqh al Manhaji*. Bandar Baru Bangi, Selangor: Dar al Syakir.
5. Muhammad Ali Qutb, (terj.) (2003). *Mutiara Perkahwinan*. Kuala Lumpur: Pustaka Haji Abdul Majid.

6. *Enakmen syariah negeri Pahang*.

Course code : UHE3182  
 Course : MALAYSIAN STUDIES  
 Pre-requisite : none

#### Synopsis

This course discusses history and politic, Malaysian Constitution, system and structure of administration, society and national unity, national development and religion and belief in Malaysia. This course aims to produce graduates who have a national identity and a spirit of patriotism. Teaching and learning will be out in the form of lectures, assignments, test and learning experiences.

#### Course Outcomes

- CO1 Describe diversity in society.  
 CO2 Explain the importance of national identity towards strenghtening the spirit of patriotism.  
 CO3 Build social relationships and interaction among students.

#### References

1. Hasnah Hussiin & Mardiana Nordin. (2011). *Malaysian Studies*. Petaling Jaya, Selangor: Oxford Fajar
2. Hasnah Hussiin & Mardiana Nordin. (2007). *Pengajian Malaysia*. Petaling Jaya, Selangor: Oxford Fajar
3. Abdul Aziz Bari. (2000). *Perlembagaan Malaysia: Asas-asas dan Masalah*. Kuala Lumpur: Dewan Bahasa dan Pustaka.
4. Asnarulkhadi Abdul Samah, Ismail Hj. Mohd Rashid, Ma'rof Redzuan & Nazaruddin Hj. Mohd Jali. (2003) *Malaysian Studies Nationhood and Citizenship*. Kuala Lumpur: Prentice-Hall
5. Auger, T. (2007). *Chronicle of Malaysia*. Kuala Lumpur, Malaysia: Editions Didier Millet.
6. Asnarulkhadi Abdul Samah, Ismail Hj. Mohd Rashid, Ma'rof Redzuan & Nazaruddin Hj. Mohd Jali. (2001). *Pengajian Malaysia*. Edisi ke-2. Kuala Lumpur: Prentice-Hall
7. Buyung Adil. (1985). *Perjuangan Orang Melayu Menentang Penjajah*. Kuala Lumpur: Dewan Bahasa & Pustaka

8. Jomo, K.S. (1998). *Pembangunan Ekonomi dan Kelas Sosial di Semenanjung Malaysia*. Kuala Lumpur: Dewan Bahasa dan Pustaka.
9. INTAN. (2004). *Malaysia Kita*. Kuala Lumpur: Percetakan Nasional
10. Mahdi Shuid & Mohd. Fauzi Yunus (2003). *Malaysian Studies*. Petaling Jaya, Selangor: Pearson Malaysia Sdn. Bhd.

Course code : UHE 3192

Course : FUNDAMENTAL IBADAH IN ISLAM

Pre-requisite: none

### Synopsis

This course is designed to equip students with a deeper understanding on basic principles of Islamic Jurisprudence and its application in fundamental ritual of worship in Islam. It covers the contemporary issue and study according to Shafie school of thought that commonly will be encountered by professionals in their working surrounding. Students will also learn contemporary ijthid (Islamic scholars' opinions) on the current issues of modern lifestyles. In general, the philosophy of the course is to develop students to become more knowledgeable on the basic of Islamic teaching which is very vital in shaping a spiritually strong individual.

### Course Outcomes

- CO1 Explain the basic principles of Islamic Jurisprudence.
- CO2 Produce the basic worship procedures of taharah, salah and saum in complex situation in work place
- CO3 Analyze the selected contemporary issues based on principles and values of Islamic Jurisprudence.

### References

1. Kamali, Mohammad Hashim. (2003). *Principles of Islamic Jurisprudence*. Cambridge: The Islamic Text Society.
2. Zaini Nasohah, Mohammad Zaini Yahya & Anwar Fakhri Omar. (2017). *Fiqh dan Persoalan Semasa*. Bangi: Penerbit UKM.
3. Basri Ibrahim. (2017). *Fiqh Sunnah: Berdasarkan Mazhab Al-Imam Al-Shafie*. Shah Alam: Karya Bestari.
4. Ramli Awang et al. (2013). *Sains*

5. Al Qardawi, Yusuf. (2005). *Fatawa Muasirah*. Cetakan ke 5 Al Qahirah: Dar al Qalam
6. Al-Zuhaili, Wahbah. (1989). *Al-Fiqh al-Islami wa Adillatuh*. Cetakan ke-4. Beirut: Dar al-Fikr.
7. Mustafa Khin, Mustafa al Bugha & Ali al Syarbaji, (terj. Zulkifli Mohamad)(2009). *Al Fiqh al Manhaji*. Bandar Baru Bangi, Selangor: Dar al Syakir

Course code : UHE 3202

Course : INTRODUCTION TO HALAL STUDIES

Pre-requisite: none

### Synopsis

This course is designed to equip students with basic understanding of halal and the halal administration particularly in Malaysia. Therefore, the subject covers the study of shariah-based halal principles and requirements pertaining to halal as stipulated in the halal authority guidelines. The course also discusses the current administration of halal especially on the Malaysian Halal Certificate and its enforcement. Student will also be exposed to an academic project on halal application in the food and non-food industry. In addition, some contemporary issues related to halal regionally and globally will be discussed as well as exposure to halal act and standards. In general, the aim of the course is to develop students to have knowledge on halal and its specific administration.

### Course Outcomes

- CO1 Explain basic concept of halal in Islam.
- CO2 Analyse halal ruling according to standards.
- CO3 Apply knowledge of halal values.

### References

1. Al-Zuhaili, Wahbah. (1989). *Al-Fiqh al-Islami wa Adillatuh*. Cetakan ke-4. Beirut: Dar al-Fikr.
2. Mustafa Khin, Mustafa al Bugha & Ali al Syarbaji, (terj. Zulkifli Mohamad)(2009). *Al Fiqh al Manhaji*. Bandar Baru Bangi, Selangor: Dar al Syakir.



3. Al Jaziri, Abd Rahman. (1990). *Kitab al Fiqh ala Mazahib al Arbaah*. Beirut: Dar al Kutub al Ilmiyyah

Course code : UHE 3212

Course : GLOBAL COMPETENCIES

Pre-requisite: none

### Synopsis

Global competence refers to the acquisition of in-depth knowledge and understanding of international issues, an appreciation of and ability to learn and work with people from diverse linguistic and cultural world community. This definition contains four basic elements:

- a. International awareness
- b. Appreciation of cultural diversity
- c. Proficiency in foreign languages
- d. Competitive skills

The overall aim of this course is to develop students intercultural awareness and competence in order to enable them to better reflect on their own roles and ability to initiate change in professional situations. It is also to provide the students with a critical understanding of issues relating to cultural identity, cultural difference and cultural diversity. Acquiring intercultural competence is both a cognitive and an affective process and its a long-term process during which the student must understand the relativity of all beliefs, values and behavior practice all over the world. The students should be able to identify and engaging in any topics of local and global significance.

### Course Outcomes

CO1 Identify the impact of globalizations and the competencies required.

CO2 Classifying the competencies that suit and effective for various situations backgrounds.

CO3 Applying the competencies in every tasks given.

### References

1. Aness Jane Ali. 2000. *The Intercultural Adaptation of Expatriate Spouses and Children An Empirical Study on The Determinants Factors Contributing to The*

*Success of Expatriation*. Gronigen, Holland.

2. Bennett, MJ. 2014. *Basic Concepts of Intercultural Communication: Paradigms, Principles, & Practices*. Intercultural Press

3. \_\_\_\_\_. 2014. Significantly revised edition of *Basic Concepts of Intercultural Communication: Selected Readings*.

4. \_\_\_\_\_. 2010. *A Conceptual History of Intercultural Learning in Study Abroad in Hoffa, B. & S. DePaul (Eds) A History of US Study Abroad: 1965-Present*.

5. \_\_\_\_\_. 2009. *Defining, Measuring, and Facilitating Intercultural Learning in Bennett, MJ (Guest Ed) Journal of Intercultural Education Volume 20, Supplement 1, January 2009, pages S1-S13*

6. \_\_\_\_\_. 2004. *Becoming Interculturally Competent in Wurzel, J. (Ed) Towards Multiculturalism: A Reader in Multicultural Education*. Intercultural Resource Corporation.

7. \_\_\_\_\_. 2009. *Developing Intercultural Sensitivity: An Integrative Approach to Global and Domestic Diversity in D. Landis, J. Bennett & M. Bennett (Eds), The Handbook of Intercultural Training, 3rd Edition*. Sage

8. \_\_\_\_\_. 2003. *Measuring Intercultural Competence: The Intercultural Development Inventory in R. M. Paige (Guest Ed) Journal of Intercultural Relations, 27(4), 421-443*

9. Downey, G.L. et al., 2006. "The Globally Competent Engineer: Working Effectively with People Who Define Problems Differently," *Journal of Engineering Education*, Vol. 95, pp. 1-17.

10. Hunter, Bill, George P. White and Galen Godbey. 2006. "What Does it Mean to Be Globally Competent?" *Journal of Studies*

in *International Education*, Vol. 10, No. 3, 267---285.

11. Hunter, William D. 2004. "Got global competency?" *International Educator*, Spring 2004, 6---12.
12. \_\_\_\_\_. 2004. "Knowledge, skills, attitudes, And experiences necessary to become globally competent." Unpublished doctoral dissertation, Lehigh University, Pennsylvania.
13. Jamal Rizal Razali 2014. *Negaraku Negara Kita*. UMP:Kuantan.
14. Kim, Young Yun. 2005. "Adapting to a New Culture: An Integrative Communication Theory." In *Theorizing about Intercultural Communication* (ed. William B. Gudykunst. pp. 375-400. Thousand Oaks, CA: Sage.
15. \_\_\_\_\_. 2006. "From Ethnic to Interethnic: The Case for Identity Adaptation and Transformation." *Journal of Language and Social Psychology* 25, 3:283-300.
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Course code : UHE 3222

Course : AL-QURAN MEMORIZATION 1

Pre-requisite: none

### Synopsis

This course is designed to equip students with a deeper understanding on basic principles of memorizing the Holy Quran. It covers the method of how to memorize, maintain and strengthen of memorizing. A part of that, students will be given practical training for memorizing from surah al-Naba until an-Nas. Students will also be trained in theoretical and practical how to pronounce the accurate maharaj huruf. In general, the philosophy of the course is to develop students to become more knowledgeable on the basic of memorizing which is very vital in shaping potential hafiz.

### Course Outcomes

- CO1 Explain the methods and elements in strengthening the memorizing the al-Quran  
 CO2: Identify the rules of tajwid and maharaj of al-Quran.  
 CO3 :Demonstrate the reading and memorizing of the Holy Quran in a way that retains the correct general rules of maharaj

### References

#### Main references:

1. Al-Quran Al-Karim .
2. Rashidi Abbas, Jamal Rizal Razali, Muhammad Nubli Abd Wahab (2016). *Anjakan Minda Huffaz Belia Malaysia*. Kuantan: Universiti Malaysia Pahang.
3. Rashidi Abbas (2016). *Hebatnya Kuasa Hafazan*. Kuantan: Universiti Malaysia Pahang (Manual).
4. Rashidi Abbas & Azhar Jaafar (2019). *Pendidikan Tahfiz dan Kemahiran Insaniah*. Penerbit Universiti Malaysia Pahang: Kuantan.
5. Ibrahim Abdul Mun'im Asy-Syaarbani (2014). *Cara Mudah Menghafal Al-Quran*. Kuala Lumpur: Pustaka Al-Shafa.
6. Amjad Qasim, Siti Nur Akma Ahmad (2013). *Menghafal al-Quran dalam Sebulan*. Kuala Lumpur: SynergyMedia.
7. Mohammad Ashraff Ayob Al-Hafiz (2011). *Kaedah Jibril*. Selangor: PTS Darul Furqan Sdn.Bhd.
8. Haji Abdul Qadir Leong (1994). *Tajwid al-Quran*. Pustaka Slam Sdn Bhd: Kuala Lumpur.

#### Additional references:

1. Imam Al-Nawawi (terj) Ahmad Asri Lubis Abu Samah (2010). *Etika Belajar&Mengajar Al-Quran*. Kuala Lumpur: Yamani Angle.
2. AbdurRahman Lubis (2011). *Tips Meghafal Al-Quran Bagi Profesional*. Selangor: Pustaka Al-Ehsan.

Course code : UHE 3232

Course : AL-QURAN MEMORIZATION 2

Pre-requisite: Al-Quran Memorization 1

### Synopsis

This course is designed to equip students with a deeper understanding on basic principles of memorizing the Holy Quran. It covers the method of how to memorize, maintain and strengthen of memorizing. A part of that, students will be given practical training for memorizing from surah al-Mulk until al-Mursalat. Students will also be trained in theoretical and practical how to pronounce the accurate maharij huruf. In general, the philosophy of the course is to develop students to become more knowledgeable on the basic of memorizing which is very vital in shaping potential hafiz.

#### Course Outcomes

CO1 Explain the methods and elements in strengthening the memorizing the al-Quran  
 CO2: Identify the rules of tajwid and maharaj of al-Quran  
 CO3 Demonstrate the reading and memorizing of the Holy Quran in a way that retains the correct meaning and the general rules of phonics.

#### References

##### Main references:

1. Al-Quran Al-Karim.
2. Rashidi Abbas, Jamal Rizal Razali, Muhammad Nubli Abd Wahab (2016). *Anjakan Minda Huffaz Belia Malaysia*. Kuantan: Universiti Malaysia Pahang.
3. Rashidi Abbas (2016). *Hebatnya Kuasa Hafazan*. Kuantan: Universiti Malaysia Pahang (Manual).
4. Rashidi Abbas & Azhar Jaafar (2019). *Pendidikan Tahfiz dan Kemahiran Insaniah*. Penerbit Universiti Malaysia Pahang: Kuantan
5. Ibrahim Abdul Mun'im Asy-Syaarbani (2014). *Cara Mudah Menghafal Al-Quran*. Kuala Lumpur: Pustaka Al-Shafa.
6. Amjad Qasim, Siti Nur Akma Ahmad (2013). *Menghafal al-Quran dalam Sebulan*. Kuala Lumpur: SynergyMedia.
7. Mohammad Ashraff Ayob Al-Hafiz (2011). *Kaedah Jibril*. Selangor: PTS Darul Furqan Sdn.Bhd.
8. Haji Abdul Qadir Leong (1994). *Tajwid al-Quran*. Pustaka Slam Sdn Bhd: Kuala Lumpur.

Course code : UHE3242

#### Course :FIQH HAJI AND UMRAH

Pre-requisite: None

#### Synopsis

This course is designed to equip students with a deeper understanding on basic principles of Hajj and Umrah. It covers the theoretical and practical elements of hajj and umrah. In addition, this subject will provide the methods of hajj and umrah problem solving, especially those related to the contemporary issues and special rulings. In general, the philosophy of the course is to develop students to become more knowledgeable on the basic of hajj and umrah.

#### Course Outcomes

CO1 Explain the meaning of Hajj and Umrah according to the al-Quran and Al-Sunah.  
 CO2 Discuss the rules of Hajj and umrah.  
 CO3 Demonstrate the contemporary knowledge about Hajj and umrah.

#### References

1. Nota Kursus Asas Haji 1440 (2019) Bahagian Bimbingan Jabatan Haji Lembaga Tabung Haji .
2. Jamaluddin Hashim (2017) *Fiqh Umrah Kontemporari*. Selangor: Darul Syakir Enterprise.
3. Al-Fatani, Muhammad ibn Isma'il Dawudi (t.th). *al-Bahr al-Wafi wa al-Nahr al-Safi*, Kuala Lumpur: Khazanah Fataniah
4. Mustafa Khin, Mustafa al Bugha & Ali al Syarbaji, (terj. Zulkifli Mohamad)(2009). *Al Fiqh al Manhaji*. Bandar Baru Bangi, Selangor: Dar al Syakir.
5. Abdul Basit Abdul Rahman (2008) *Makkah al-Mukarramah : Kelebihan & Sejarah*. Kuala Lumpur: Telaga Biru.
6. Al-Zuhaili, Wahbah. (1989). *Al-Fiqh al-Islami wa Adillatuh*. Cetakan ke-4. Beirut: Dar al-Fikr.

Course code : UHE3252

Course :POSITIVE PSYCHOLOGY

Pre-requisite: None

#### Synopsis

Positive Psychology is built on the belief that there are many things that can be achieved in

life. As everyone wants a meaningful and satisfying life; everybody needs the opportunity to build and nurture the best in themselves, to experience appreciation, love, work and play. Celebrating these human potentials, the course will focus on three key issues: positive emotions, positive attitudes, and positive institutions. Positive emotions include topics related to satisfaction with what we have gone through, the excitement of what is to come and hope for what the future would bring. Positive attitude also includes topics associated with the strengths and virtue of a person. While a positive institution involves the topic of things that can foster a better society.

#### Course Outcomes

- CO1 Identify major theories and application of positive psychology from scientific and Islamic perspective.
- CO2 Explain the concept and principles related to positive psychology and its application.
- CO3 Analyze scientific and ethical principles in the application of positive psychology in everyday life.

#### References

1. Compton, W.C. & Hoffman, E. (2013). *Positive psychology: The science of Happiness and flourishing*. US: Wadsworth, Cengage learning.
2. Joseph, S., Linley, P.A., & Maltby, J. (2006). Positive psychology, religion, and spirituality. *Mental Health, Religion, & Culture*, 9,209-212.
3. Ong, A.D., Bergeman, C.S., Bisconti, T.L., & Wallace, K.A. Psychological resilience, positive emotions, and successful adaptation to stress in later life. *Journal of Personality & Social Psychology*, 91.730-749
4. Sligman, M. & Csikszentmihalyi, M. (2000). Positive psychology: an introduction. *American Psychologist*, 55-5-14.
5. Turner, N., Berling, J., Zacharatos, A. (2002). Positive Psychology at work: *Handbook of positive psychology*. NY: Oxford University Press.

Course code : UHE3262

#### Course : FOUNDATION IN FOUNDATION IN TECHNICAL AND VOCATIONAL EDUCATION AND TRAINING (TVET)

Pre-requisite: None

#### Synopsis

This course discusses about philosophies in Technical and Vocational Education and Training such as essentialism, pragmatism and existentialism as well as its relation to the National Education Philosophy in the context of developing viable and professional workforce for this country. The discussion also covers human nature, the role of educators and the role of Technical and Vocational Education and Training (TVET) institutions. Principles in TVET education such as the need for workforce in term of lifelong learning, special education, education for all, justice in career and gender work placement as well as work ethic are also discussed. Moreover, the principles and evaluation process to develop human potential holistically are also discussed

#### Course Outcomes

- CLO1: Identifying the importance of Philosophy in Technical and Vocational Education and Training.
- CLO2: Explain the principles in TVET
- CLO3: Design Assessment in TVET

#### References

1. Melvin D. Miller (1985). Principles and a Philosophy for Vocational Education. National Centre For Research in Vocational Education, Ohio State University.
2. Faizal Amin Nur Yunus. (2016). *Pemindahan pembelajaran pendidikan latihan teknikal dan vokasional*. Universiti Kebangsaan Malaysia Press
3. John Fien, Rupert Maclean & Man-Gon Park (2009). *Work, learning, and sustainable development: opportunities and challenges*. Springer
4. Moodie, Gavin (2008). *From vocational to higher education [electronic resource] : an international perspective*. Berkshire, England : Society for Research into Higher Education : Open University Press
5. Noel S. Anderson and Haroon Kharem (2009). *Education as freedom [electronic resource] : African American educational*

thought and activism: Lanham : Lexington Books,

Course code: UHE3272

Course: INTRODUCTION TO SOCIAL SCIENCE

Pre-requisite: None

### Synopsis

This course provides an approachable and contemporary introduction to the disciplines and subjects that form the social sciences. The aim of this course is to explore and understand the development of modern society and the impact of change in society. Ultimately, through the exploration and application of the scientific method and a multi-disciplinary approach, students will better conceptualize societal problems and situations, domestic and internationally (personal and professional life).

### Course Outcomes

CO1: Identify the pivotal social institutions (family, education, religion, and economics) in society

CO2: Analyze the situation from a multi-disciplinary perspective or scientific study of a societal issue conducted in society and industry

CO3: Demonstrate (orally and in written form) the knowledge in current issues of stratification, globalization, technology, environment, deviance, race, ethnicity, age, and gender

### References

1. David C. Colander . (2015). Social Science: An Introduction to the Study of Society -- Pearson Publisher Routledge (ISBN 1317344154, 9781317344155).
2. Hans Fink. (2012). Falsafah Sosial (terjemahan Rustam Sani). KL:DBP
3. Hunt, E. F and Colander, D. C. (2015). Social Science : An Introduction to the Study of Society. Boston:Pearson.
4. Ismail Yusoff. (2015). Pengenalan Sains Sosial. Sintok : Penerbit UUM.
5. Rohana Yusof. (2001). Penyelidikan Sains Sosial. Sintok : Penerbit UUM
6. Schaefer, R. T. (2016). Sociology. New York :McGraw-Hill.

Course code : UHE3282

Course : PALESTINE STUDIES

Pre-requisite: None

### Synopsis

This course aims to provide an overview of the significances, history, and development of Palestine as one of the modern states that still live under occupation. The course addresses the uniqueness of this multicultural and multireligious state from monotheistic religious perspectives and geopolitical approaches. By the end of this course, the students should be able to demonstrate a critical understanding of the history of Palestine and the development of the Palestine-Israel conflict, its impacts on the region, and how historical Palestine should be scholarly examined as a model of peace and harmony.

### Course Outcomes

CO1: Explain the history of Palestine from monotheistic religious sources and geopolitical perspectives.

CO2: Apply the concept of peaceful communities through the inclusive vision of Palestine during the reign of Muslim rulers.

CO3: Analyze the peace plan of the Middle East.

### References

1. Ahmad Irfan bin Ikmal Hisham. (2020). Hikmah Pemilihan Masjidil Aqsa Dalam Israk Mikraj. Berita Harian 27 Mac 2020.
2. Ahmad Irfan bin Ikmal Hisham. (2020). Masjidil Aqsa Simbol Kemuliaan. Harian Metro. 21 Mac 2020
3. Mohd Roslan Mohd Noor & Abdul Qayyum Suhaimi. (2018). Intifadah al-Aqsa: Kebangkitan Rakyat Palestin. Kuala Lumpur: UM Press.
4. Carole Hillenbrand. (2005). Perang Salib: Sudut Pandang Islam. Jakarta: Serambi Ilmu
5. Mohd Roslan Mohd Noor (2016). The Significance of Islamicjerusalem in Islam. Kuala Lumpur: UM Press.
6. Abd al-Fattah al-Awaisi. (2008). Meneroka Identiti Islamicjerusalem (editor. terj Mohd Roslan Mohd Noor). Kuala Lumpur: APIUM.
7. Gregory S Mahler & Alden Mahler. (2009). The Arab-Israeli Conflict. New York: Routledge.

8. Adrie Noor al-Fatia. (2015). Membongkar Misteri 3 Masjid Suci. Batu Caves: PTS.
9. ZAINAL ABIDIN, Ummu Zainab Al-Abidah; MOHD NOR, Mohd Roslan. THE STUDIES ON DEMOGRAPHIC HISTORY ON PALESTINE DURING BRITISH ADMINISTRATION, 1917-1948: ISSUES AND CONCERNS. *Journal of Al-Tamaddun*, [S.l.], v. 8, n. 1, p. 99-113, June 2013. ISSN 2289-2672. Available at: <<https://ejournal.um.edu.my/index.php/JAT/article/view/8652>>. Date accessed: 20 Aug. 2020.
10. MOHD NOR, Mohd Roslan; ZAKARIA, Nor Dalila. Perancangan Zionis Ke Arah Pembentukan Negara Israel. *Jurnal Usuluddin*, [S.l.], v. 30, p. 227-250, Dec. 2009. ISSN 0128-0708. Available at: <<https://ejournal.um.edu.my/index.php/JUD/article/view/7366>>. Date accessed: 20 Aug. 2020.

Course code : UHE3292

Course : INTRODUCTION TO ISLAMIC ASTRONOMY

Pre-requisite: None

#### Synopsis

This course introduces the students to the foundation of Islamic astronomy. In addition to the historical development of astronomy and cosmology, this course also covers the Quranic and Hadith verses on astronomy, and how the scholars from time to time expand the understanding and application to certain area of 'ibadah. That including the science of time keeping based on the movement of celestial object, calendar system, astrometry and others. The students will learn basic calculation of astronomy, including spherical trigonometry to determine the azimuth of Qiblah and prayer time

#### Course Outcomes

CO1: Explain the history and concept of Islamic astronomy.

CO2: Apply the science of celestial object in administrating certain area of 'ibadah in daily life

CO3: Calculate the time of prayers and direction of Qiblah based on astrometry and derivatives of celestial object

#### References

1. Baharrudin Zainal, Ahmad Irfan, Shahrin dan Ahmad Taufan. (2018). Modul Kokurikulum Falak. Pekan: Jabatan Mufti Negeri Pahang.
2. Ahmad Irfan bin Ikmal Hisham. (2019). *Jasad-jasad Samawi Dalam al-Kutub al-Sitta: Ke Arah Pembangunan Modul Pembelajaran Astronomi Islam*. Tesis Ijazah Kedoktoran Akademi Pengajian Islam Universiti Malaya.
3. Ahmad Irfan bin Ikmal Hisham, Ishak Suliaman. (2016). "Analisis Tematik Kalimah al-Hilal di Dalam al-Kutub al-Sittah," *Takwim Hijri; Isu & Pengurusan*, ed. Mohd Shukri Hanapi & Shahir Akram Hassan. Pulau Pinang: ISDEV.
4. Ahmad Irfan bin Ikmal Hisham, Ishak Suliaman. (2016) "Sikap dan Peranan Pencerap Muslim Semasa Gerhana Matahari Menurut Hadis," *Prospektus Gerhana Matahari 2016*. Kuantan: Jabatan Mufti Negeri Pahang.
5. Baharrudin Zainal. (2004). *Ilmu Falak Edisi Kedua*. Kuala Lumpur: DBP.
6. Susiknan Azhari. (2011). *Ilmu Falak: Perjumpaan Khazanah Islam dan Sains Modern*. Yogyakarta: Penerbit Suara Muhammadiyah.
7. Aizan Ali @ Mat Zain. (2017). *Astronomi Dalam Islam*, *Sejarah Astronomi Islam Di Malaysia*, ed. Aizan Ali @ Mat Zain. Kuala Lumpur: Penerbit Universiti Malaya.
8. King, David A. (2012). *Islamic Astronomy and Geography*. Surrey: Ashgate Publishing Limited.
9. Mohammad Ilyas. (2007). *Masa Depan Taqvim Islam*, *Koleksi Kertas Kerja Semnar Persatuan Falak Syar'i Malaysia (1406H/1986M - 1425H-2004M)*. Batu Caves: Persatuan Falak Syar'i Malaysia.
10. **Mohammad Ilyas. (2003). *Astronomi Islam Dan Perkembangan Sains: Kegemilangan Masa Lalu, Cabaran Masa Depan*. Kuala Lumpur: Institut Terjemahan Negara Malaysia Berhad.**

Course code: UHE3302

Course: INTRODUCTION TO POLITICAL SCIENCE

Pre-requisite: None

#### Synopsis

This course introduces basic matters in political science. The discussions ranged from the following aspects: power, state existence, sovereignty, law, constitution, doctrine of separation of powers, government, autocracy and democracy. Thus, students will be politically proficient to discuss the governance and management of the country.

#### Course Outcomes

CO1: Describe basic concepts of political science.

CO2: Explain issues related to basic concepts of political science.

CO3: Discuss the practice of basic concepts based on examples of specific countries.

#### References

1. Ramanathan, K. (2013). *Asas Sains Politik*, Oxford Fajar: Kuala Lumpur. [JA66.R34]
2. Syed Ahmad Hussen (1994). *Pengantar Sains Politik*, Penerbit Bersama Dewan Bahasa dan Pustaka dan Pusat Pengajian Luar Kampus USM: Kuala Lumpur.
3. Abdul Rashid Moten (2013). *Government and Politics in Malaysia*, Cengage Learning: Singapore.
4. Syed Serajul Islam & Abdul Rashid Moten (2013). *Political Science: A Primer*, Thompson: Singapore.
5. Abdul Rashid Moten & Syed Serajul Islam (2009). *Introduction to Political Science*, Cengage Learning: Singapore.

Course code: UHE3312

Course: INTRODUCTION TO INTERNATIONAL LAW

Pre-requisite: None

#### Synopsis

This course provides students with an introduction to law in its global context in this age of trans-national and inter-jurisdictional practice, with particular focus on public international law and its role in shaping the international legal order. The course commences with an introduction to the development and nature of public international law as well as distinctive elements of international legal reasoning. It then addresses key features of international

law, with topics chosen from: the sources of international law with emphasis on customary international law and the law of treaties; international fact finding; the structure of the international community and participants in the international legal system; the peaceful settlement of international disputes; state responsibility; jurisdiction and immunity; international maritime law and the law of the sea; the use of force; international human rights; and the law of armed conflict.

#### Course Outcomes

CLO1: Identify the nature of international law and the structure of the international legal system and explain the basic elements of public international law.

CLO2: Describe the issues of international law, both orally and in writing.

CLO3: Analyse the impact of international law on diverse peoples, and critique the operation of international law from a range of ethical perspective

#### References

1. Abdul Ghafur Hamid. 2011. *Public International Law: A practical approach*. Selangor Malaysia: Sweet & Maxwell Asia.

Course code : UHE3322

Course : INTRODUCTION TO ISLAMIC MEDICATION PRACTICE

Pre-requisite: None

#### Synopsis

This course introduces concepts, theories and basic practices of Islamic Medication Practice. These practices are based on Al-Quran, As-Sunnah and practices of Muslim renowned scholars. It also will discuss on the nature of jinn and syaitan and their roles in causing harm to human kind such as sihr and hysteria. The course also will expose the current issues in Traditional and Complementary Medicine (TCM) as well as latest progress in the implementation of the TCM Act 2017.

#### Course Outcomes

CLO1: To identify the sources of Islamic Medication Practice

CLO2: To describe various kinds of Islamic

## Medication Practices

CLO3: To apply basic methods in Islamic Medication

### References

1. Mahyuddin Ismail (2015). Isu-isu berkaitan Akidah dan Syariah Dalam Perubatan Tradisional & Kontemporari. Gambang: Penerbit UMP.
2. Mahyuddin Ismail (2010). Ahli Sihir ke Tali Gantung. Batu Caves: PTS Publication.
3. Haron Din. 2009. Menjawab Persoalan Makhluk Halus: Kaitannya dengan Penyakit dan Pengubatan. Selangor: Persatuan Kabajikan dan Pengubatan Islam Malaysia (Darussyifa') & Koperasi Darussyifa'
4. Jahid Sidek, Dr., Berpawang dan Bersahabat dengan Jin dari Perspektif Islam, 2004, Utusan Publications & Distributor Sdn. Bhd., Kuala Lumpur.
5. Jalaluddin Abdul Rahman As-Suyuti (terjemahan Nor Azlina Abd. Aziz). Kaedah Perubatan Rasulullah SAW. Kuala Lumpur: Synergy Publishing Co
6. t.p. 2008. Garis Panduan Perbomohan Menurut Islam. Kuala Lumpur: Jabatan Kemajuan Islam Malaysia

Course code : UHE3332

Course : ZIKIR (ISLAMIC REMEMBRANCE) FOR HUMAN DEVELOPMENT

Pre-requisite: None

### Synopsis

This course is introduced to discover the concept of zikir and its importance for self-transformation. It covers the concept of zikir, types of zikir, the importance, mazhab of zikir, methodology of zikir and zikir implementation on specific self transformation activities. This course also explains the effect of zikir sirri, jahri, quranic recitation, and solat on human psychophysiological changes. Students will also learn scientific methods on the effects of zikir on self changes within brain, heart, skin, breathing behavior using a biophysiological approach. At the end of this course, students will learn the practical approach on zikir used in the process of self-transformation in organizations and industrial work setting.

## Course Outcomes

CLO1: Understand types of zikir and its specific characteristics

CLO2: Characterize the effects of zikir on psychophysiological changes

CLO3: Applying specific zikir techniques in behavior change activities

### References

2. John L. Andreassi, Psychophysiology: Human Behavior and Physiological Response 5th Edition, Lawrence Publishers, 2007
3. Inna Z. Khazan, The Clinical Handbook of Biofeedback: A Step-by-Step Guide for Training and Practice with Mindfulness 1st Edition, Kindle Edition
4. Gary Groth-Marnat, A. Jordan Wright, Handbook of Psychological Assessment 6th Edition, Kindle Edition
5. Nubli, Rahsia Pembangunan Spiritual Teknik Biomaklumbalas, Penerbit UMP, 2017
6. Nubli, Modul Rahsia Hati dan Perubahan Diri, Penerbit UMP, 2016
7. Nubli, Modul Bina Insan Menggunakan Teknik Biofeedback, Penerbit UMP, 2016
8. Nubli, Merubah Diri dalam 21 Minit, Penerbit UMP, 2015
9. Nubli, Kit Zikir Untuk Remaja, Penerbit UMP, 2015
10. Nubli, Siri Kecemerlangan Pengurusan Organisasi Dalam Islam 3, Penerbit UMP, Kuantan, 2012
11. Nubli, Siri Kecemerlangan Pengurusan Organisasi Dalam Islam 4, Penerbit UMP, Kuantan, 2012
12. Stephen W. Porges, The Pocket Guide to the Polyvagal Theory: The Transformative Power of Feeling Safe, 1st Edition, Kindle Edition
13. Diane Papalia, Experience Human Development 13th Edition, Kindle Edition □

Course code : UHE3342

Course : STRATEGIC THINKING OF ICONIC ASIAN LEADERS

Pre-requisite: None



## Synopsis

This course discusses the ideological thought of towering personalities in Asian history. The student will learn strategic thinking and planning of selected leaders in Malaysia, Singapore, Japan, Thailand, China, India, Philippines, and Korea that significantly drive their country to become a developed and modern state. The discourse is very significant due to the uniqueness of their style in shaping their country's identity in this contemporary world. This course will offer the students better awareness and knowledge on strategic thinking, insightful, confidence, and independence to become future leaders of Malaysia.

## Course Outcomes

CO1: Identify the ideologies of selected leaders in Asia.

CO2: Discuss the strategic thinking aspects of each leaders.

CO3: Analyze the impact of their vision and leadership towards politic, economy and social.

## References

1. Hasnah Hussiin, "Tun Abdul Razak, Bapa Pembangunan Negara," dalam *Dirgahayu Pahang Darulmakmur*, Penerbit Universiti Malaysia Pahang, 2019.
2. Conrad Schirokauer et.al, *A Brief History of Chinese and Japanese Civilizations*, 4th Edition, 2013.
3. *Jepun: Sejarah dan Budaya*, Penerbit Universiti Malaya, 2006
4. Maswari Rosdi, *Nota lengkap sejarah China dan Jepun*, Siri nota lengkap Fajar Bakti, Fajar Bakti, 1991.
5. Chris Baker, *Pasuk Phongpaichit, A History of Thailand*, Cambridge University Press, 2005.
6. James Wise, *Thailand: History, Politics and the Rule of Law*
7. Lee Kuan Yew, *From Third World to First: The Singapore Story - 1965-2000 Hardcover – Illustrated*, October 3, 2000.
8. *The Singapore Story: Memoirs of Lee Kuan Yew, Vol. 2: From Third World to First, 1965-2000 Hardcover – January 1, 2000.*

9. Jose Rizal, *Noli Me Tangere*, Translator: Pascual H. Poblete, December 30, 2006.
10. "The Miracle with A Dark Site: Korean Economic Development Under Park Chung-hee", Institute for International Economic, <http://www.iie.com/>.
11. *The Park Chung Hee Regime in South Korea*, <https://www.sjsu.edu/faculty/watkins/park.htm>.
12. Niels Mulder, *Wacana publik Asia tenggara: menuju masyarakat madani?*, Penerbit Kanisius, Yogyakarta, 2005.

Course code : UHE3352

Course : INTRODUCTION TO ISLAMIC JURISPRUDENCE AND MAQASID SYARIAH

Pre-requisite: None

## Synopsis

This course discusses basic principles of Islamic jurisprudence and maqasid Syariah. The discussion covers basic principles of Islamic jurisprudence such as it's definition, sources of jurisprudence and the application. The subject also covers a brief discussion on maqasid Syariah like definition, division and its roles in setting contemporary Islamic ruling.

## Course Outcomes

CO1: Explain basic principles of Islamic jurisprudence and maqasid Syariah

CO2: Apply the basic principles of Islamic jurisprudence and maqasid Syariah

CO3: Evaluate selected contemporary issues based on basic Islamic principles and maqasid syariah.

## References

1. Mohammad Hashim Kamali, *Principles of Islamic Jurisprudence* (Selangor: Ilmiah Publisher, 2013).
2. H. Amir Syarifuddin, *Ushul Fiqh* (Jakarta: Kencana Prenadamedia Grup, 2008).
3. Al-Raysuni, Ahmad, *Theory of the Higher Objectives and Intents of Islamic Law* (Selangor: Islamic Book Trust, 2011).
4. Al Zuhaili, Wahbah, *Usul al Fiqh al-Islami* (Beirut: Dar al Fikr, 1998).

- Al-Yubi, Muhammad Sa'd bin Ahmad, *Maqasid al-Shari'ah al-Islamiyyah wa 'Alaqatuha bi al- Adillah al-Shar'iyah* (Riyad : Dar al-Hijrah, 1998).

Course code : UHE3362

Course : INSTRUCTIONAL DESIGN AND TECHNOLOGY IN TVET

Pre-requisite: None

### Synopsis

This course is designed to develop understanding about Education Technology; "technology" and "education" in context of teaching and learning (T&L) including; learning theories, teaching strategies, instructional design, dan T&L assessment assisted by technology. The understanding at this stage will help students to decide the best design and methodology to implement in T&L with the latest technology. Next, students will be exposed to skills of T&L development using either online or offline technology. The instructional design model called ADDIE will provide a basic guideline to develop technology based T&L projects in this course. The students' understanding will be assessed based on mid-term test, T&L project, and presentations.

### Course Outcomes

CLO1: Define the meaning and scope of education technology [KNOWLEDGE]

CLO2: Apply the instructional design model in T&L project development with effective [APPLY]

CLO3: Evaluate the effectiveness of the project from T&L perspective [ANALYSIS, EVALUATE]

CLO4: Evaluate the understanding of T&L project and development [KNOWLEDGE]

### References

- Mohd. Hasril Amiruddin, Alias Masek. (2014). *Inovasi dalam teknologi pendidikan : isu dan cabaran*. LB1028.3 .H37 2014
- Noriati A. Rashid. (2009). *Teknologi dalam pengajaran dan pembelajaran*. LB1028.3.T45 2009
- Pengajaran dan pembelajaran : teori dan praktis*. LB1025.3.P46 2009

- Innovations in mobile educational technologies and applications*. LB1028.3.I56 2013

- Handbook of research on educational communications and technology*. LB1028.3 .H36 2014

Course code : UHE3372

Course : COMPLEX PROBLEMS SOLVING SKILLS

Pre-requisite: None

### Synopsis

This course is designed to expose students to complex problem-solving skills. In this course, 6 approaches or methods of problem solving will be introduced. For each topic, students will be exposed to the elements and techniques that can be used. Students will also practice and apply the skills, methods and techniques they have learned in the process of solving real problems that occurred. These complex problem-solving skills will help them facing and dealing the challenges in the work and life.

### Course Outcomes

CO1: Identify the elements in respective thinking skills methods

CO2: Determine the problem solving method for the selected issues and problems.

CO3: Demonstrate the problem solving methods in selected issues and problems.

### References

- Hélène Edberg. 2018. *Creative Writing for Critical Thinking: Creating a Discoursal Identity*. 2018. Palgrave McMillan: Switzerland (ISBN 978-3-319-65491-1 (eBook)) (ISBN 978-3-319-65490-4).
- Robert DiYanni . 2015. *Critical and Creative Thinking: A Brief Guide for Teachers*. Wiley Blackwell.
- Joe Y. F. Lau. 2011. *An Introduction to Critical Thinking and Creativity: Think More, Think Better*. John Willey & Sons : Canada.
- Nurulhuda Abd Rahman, Md Nasir Ibrahim. 2013. *Pemikiran kritis dan kreatif: konsep, pendekatan dan aplikasi dalam pengajaran dan*

- pembelajaran. Penerbit Universiti Pendidikan Sultan Idris : Perak (ISBN 9670480256, 9789670480251).
5. Jamal @ Nordin Yunus. 2012. Pemikiran kritis dan kreatif: teori dan aplikasi. Kaisar Media Kreatif. (ISBN 967113730X, 9789671137307).
  6. Tim Hurson. 2012. Think Better: An Innovator's Guide to Productive Thinking. McGraw-Hill.
  7. Moti Frank. 2016. Systems Thinking: Foundation, Uses and Challenges Management science : theory and applications. Nova Science Publishers, Incorporated. (ISBN 1634852419, 9781634852418).
  8. Yavuz Ercil. 2020. Systems and Systems Thinking. Trafford : Canada.
  9. Robert Curedale. 2013. Design Thinking: Process and Methods Manual Design methods series. Design Community College. (ISBN 9780989242, 9789780989248).
  10. Hasso Plattner, Christoph Meinel, Larry Leifer (eds.). 2016. Design Thinking Research: Making Design Thinking Foundational. Stanford : Springer.
  11. Roberta Null. 2011. Universal Design: Principles and Models. Taylor & Francis : NY
  12. Sheryl Burgstahler. 2015. Universal Design in Higher Education: From Principles to Practice. Harvard Education Press. (ISBN 1612508170, 9781612508177).
  13. Yeoh Teong San. 2014. TRIZ - Systematic Innovation in Business & Management. Akitiara Sdn. Bhd : KL.
  14. By Yeoh Teong San, Yeoh Tay Jin, Song Chi Li. 2009. TRIZ: Systematic Innovation in Manufacturing. First Fruit Sdn. Bhd : KL.
  15. Imaduddin Abidin, Jamal Rizal Razali, et. Al. 2020. UHS2021 Soft Skills Module TRIZ@UMP. Indie Publisher : Kuantan.
  16. Imaduddin Abidin, Jamal Rizal Razali & Anita Abdul Rani. 2016 . TRIZ : Strategi Pemecahan dan Penyelesaian Masalah secara Tuntas. IJHTC (Vol 2: Issue 1, December 2016). UMP : Kuantan.
  17. Jamal Rizal Razali 7 Imaduddin Abidin. 2018. Pendekatan Inventif

TRIZ dan 11 Tools dalam Kemahiran Penyelesaian Masalah. IJHTC. UMP : Kuantan.

18. Imaduddin Abidin, Jamal Rizal Razali & Azimi Hamzah, et. Al .2018. Modul Trans-B. UMP : Kuantan.

Course code : UHE3382  
Course : ARABIC CORPUS 1  
Pre-requisite: None

#### Synopsis

This course focuses is designed to those who want to get moderate understanding of the content of selected surahs in al-Quran namely al-Fatihah and al-Qadr through the study of its corpus/vocabulary in some degree of detail. Students will be studying the root of the word, basic grammatical condition, morphology, meaning, English and Malay translation and the correct writing of the verse.

#### Course Outcomes

- CLO1: List important corpus in selected surahs  
CLO2: Demonstrate the root and basic grammar in related verses  
CLO3: Organize the right meaning, translation and writing of related verses

#### References

1. Al-Quran Bertajwid dan Terjemahan berserta Ensiklopedia al-Quran, Yayasan Restu Nasyrul Quran, Cetakan 2020, Selangor Malaysia.
2. Othman Arifin, CARA MUDAH BELAJAR BAHASA ARAB (BUKU 6), ISBN: 9789675115363, Kuala Lumpur.

Course code : UHE3392  
Course : I'JAZ AL QURAN  
Pre-requisite: None

#### Synopsis

This course focuses on explaining remarkable characteristic of al-Quran

which is its miraculoos (I'jaz) nature. As an important source of Islamic teaching, it is recommendable to everyone to embark into studying and exploring al-Quran to strengthen the belief of its greatness. This course covers topics such as the inimitability, literary aspects and preservation of a-Quran. Futhermore topics such as the preservation, predictions about the future, exixtence of Allah and other topics will be covered. Students in the end will appreciate the greatness of the Holy Quran in the Islamic teaching and syariah.

#### Course Outcomes

- CLO1: define the miracles of al-Quran  
 CLO2: demonstrate the miraculoos nature of Quran  
 CLO3: identify verses relating to miraculoos matters taught in the Quran

#### References

Al-Hidayah, Kuala Lumpur.

- إعجاز القرآن) ت: صؤدر  
 1. محمد بن الطوب أبو بكر الباقالزي

Course code : UHE3402  
 Course : PSYCHOLOGY IN THE QURAN & SUNNAH  
 Pre-requisite: None

#### Synopsis

This course is designed to expose students to the basic concepts and major foundations of psychology in the Quran and the Sunnah. It discusses the part of human creation, human nature and purpose of creation in life from the modern psychological perspectives and Islamic views. It also emphasizes on the major aspects and the application of psychology in human activities from the Quranic and Prophetic principles. In general, the philosophy of this course is to provide students with comprehensive understanding about human psychology from the values and norms of Divine Revelation and modern perspectives.

#### Course Outcomes

CLO1: To describe the concept and major

foundations of psychology from the perspective of Quran and Sunnah.

CLO2: To display the communication skills in explaining the concept and application of major psychological foundations from the Quranic and Sunnah perspectives

CLO3: To apply the principles of psychology from the Quranic and the Sunnah perspectives in dealing with the psychological issues

CLO4: To analyze the issues of human psychology from the Islamic point of views.

#### References

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Course code : UHE3412  
 Course : LEADERSHIP IN TVET  
 Pre-requisite: None

#### Synopsis

This course is intended to introduce learners to the concept and principles of leaders and leadership in TVET. The emphasis of the course will be on providing the knowledge of characteristic and skills for TVET students with a clear grounding on the issues of TVET in Malaysia and worldwide and the challenges of TVET in Malaysia. Apart from the theoretical and concept of TVET, learners will be exposed with the roles of TVET leaders and the strategies for positioning TVET organizational excellence

#### Course Outcomes

CLO1: describe the concept of leaders and leadership in the TVET context.

CLO2: to demonstrate a thorough comprehension on the phenomena of TVET organizational excellence with the unique roles of TVET leader issues and challenges in TVET

CLO3: to articulate the characteristic and skills needed as TVET student to be a leader

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Course code : UHE3422  
 Course : INTRODUCTION TO INDUSTRIAL AND ORGANIZATIONAL PSYCHOLOGY  
 Pre-requisite: None

### Synopsis

This course is designed to expose students to the concept and major aspects of psychology in the workplace. Industrial and Organizational Psychology (I-O Psychology) is concerned with the theory and application of psychological principles and methods to management, employee functions, issues and challenges in work settings. It plays important roles in the personnel performance, job satisfaction, organizational commitment, well-being, and organizational effectiveness. It also identifies how employee attitudes and behaviors can be improved through best practices of recruitment and selection, leadership, communication, training programs, performance appraisal, organization and management systems, motivation, and ethical values in the workplace.

### Course Outcomes

- CLO1: Explain and analyze the concept and major aspects of Industrial and Organizational Psychology.  
 CLO2: Display the communication skills in explaining the concept and application of psychology in the workplace.  
 CLO3: Examine various workplace issues and suggest practical solutions from the psychological principles and perspectives.

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5. Jex, S.M. & Britt, T.W. (2014). *Organizational psychology: A scientist-practitioner approach* (3<sup>rd</sup> ed.). Hoboken, NJ: John Wiley & Sons, Inc.
6. Rothmann, I. & Cooper, C.L. (2015). *Work and organizational psychology* (2<sup>nd</sup> ed.). East Sussex: Routledge.
7. Spector, P.E. (2018). *Industrial and organizational psychology: Research and practice* (7<sup>th</sup> ed.). Hoboken, NJ: John Wiley & Sons Inc.

Course code : UHE3432  
 Course : KURSUS INTEGRITI DAN ANTI RASUAH (KIAR)  
 Pre-requisite: None

### Synopsis

This course includes the fundamental knowledge of integrity and discuss the concept of self-control to build an outstanding personality with integrity and anti-corruption. In addition, the act of corruption and the power abuse in daily life and organization are also discussed. The real case study are critically examine in the learning session along with the integration of knowledge and experience from SPRM and ex-offenders.

### Course Outcomes

- CLO1: Understand the principle of self control and the value of integrity to prevent corruption (PLO1)  
 CLO2: Appreciate the values and the importance of integrity to prevent the act of corruption to educate the future leaders (PLO4)  
 CLO3: Appreciate the values and the importance of integrity to prevent the act of corruption to educate the future leaders (PLO4)

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- Palifka, B. J. (2016). *Corruption and government: Causes, consequences, and reform*. Cambridge university press.
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Course code : UHE3442

Course : INTRODUCTION TO TRAINING MANAGMENT

Pre-requisite: None

### Synopsis

This course is designed to prepare students with knowledge and skills in becoming a trainer or a facilitator in selected topics related to Soft Skills/technical skills in an organization. This course will also offer them understanding in the philosophy of trainings and courses in an organization, adult learning, training needs analysis, pre and post-test and preparation before, during and after a training. Students will also be guided in writing a paper work for a training, how to present the paperwork in front of potential clients, to conduct a training using the methods learnt and also to conduct a feedback session. This course is also designed to ensure the students are involved actively in the learning process. The learning session will carry out skills such as simulation, discussion, case study, role play, check list and also interactive games, suitable to the needs of the training.

### Course Outcomes

- CLO1: Explain the concept and philosophy of training aligned with National Philosophy of Education
- CLO2: Discuss the methods in managing training
- CLO3: Design a training suitable to the needs of an organization

### References

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11. [https://www.youtube.com/watch?v=Guvtagf\\_tq4](https://www.youtube.com/watch?v=Guvtagf_tq4)
12. <https://www.youtube.com/watch?v=Y0ltF1s9O9Y>

Course code : UHE3452

Course : INTRODUCTION TO GUIDANCE AND COUNSELING

Pre-requisite: None

### Synopsis

This course is designed to equip students with basic in guidance and counseling skills. This course is very important as a preparation platform for students to enter the workforce; furthermore to develop effective relationship in daily life. This course will help students to enhance their knowledge in communicating skills as a member of organization and in a family institution. It is important to instill guidance and counseling skills in an individual: including building rapport, pre-

session skills, listening skills, developing a therapeutic environment, paraphrasing skills, empathy, open ended questioning skills, communication skills, asking for clarification, persuasive skills, reflecting skills and summarizing skills. These guidance and counseling skills will assist students in acquiring effective communication skills that will prepare them to become an understanding leader in the society.

### Course Outcomes

CLO1: Explain the importance of guidance and counselling skills in developing a healthy relationship with others

CLO2: Discuss the methods in applying guidance and counseling skills in an organization

CLO3: Design a program which can apply guidance and counseling skills

### References

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