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UNIVERSITI MALAYSIA PAHANG

COURSE INFORMATION 2021/2022

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UMPMalaysia

TEKNOLOGI UNTUK MASYARAKAT

5 STARS	751-800	#133 ASIA
QS RATED FOR EXCELLENCE 2018	QS WORLD UNIVERSITY RANKINGS 2021	QS WORLD UNIVERSITY RANKINGS 2021

1 COLLEGE OF ENGINEERING

B.ENG (HONS.) CHEMICAL ENGINEERING
B.ENG (HONS.) CIVIL ENGINEERING
B.ENG (HONS.) MECHANICAL ENGINEERING
B.ENG (HONS.) MECHANICAL ENGINEERING (AUTOMOTIVE)
B.ENG (HONS.) ELECTRICAL ENGINEERING (POWER SYSTEM)
BACHELOR OF INDUSTRIAL ENGINEERING WITH HONOURS

2 FACULTY OF CIVIL ENGINEERING TECHNOLOGY

BACHELOR OF ENGINEERING TECHNOLOGY (INFRASTRUCTURE MANAGEMENT) WITH HONS.
BACHELOR OF ENGINEERING TECHNOLOGY (ENERGY & ENVIRONMENTAL) WITH HONS.

3 FACULTY OF COMPUTING

BACHELOR OF COMPUTER SCIENCE (SOFTWARE ENGINEERING) WITH HONOURS
BACHELOR OF COMPUTER SCIENCE (COMPUTER SYSTEMS & NETWORKING) WITH HONOURS
BACHELOR OF COMPUTER SCIENCE (GRAPHICS & MULTIMEDIA TECHNOLOGY) WITH HONOURS

4 FACULTY OF ELECTRICAL AND ELECTRONICS ENGINEERING TECHNOLOGY

BACHELOR OF ENGINEERING TECHNOLOGY (ELECTRICAL) WITH HONOURS
BACHELOR OF ELECTRONICS ENGINEERING TECHNOLOGY (COMPUTER SYSTEM) WITH HONOURS
BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY (POWER & MACHINE) WITH HONOURS

5 FACULTY OF INDUSTRIAL MANAGEMENT

BACHELOR OF PROJECT MANAGEMENT WITH HONOURS
BACHELOR OF INDUSTRIAL TECHNOLOGY MANAGEMENT WITH HONOURS
BACHELOR OF BUSINESS ENGINEERING WITH HONOURS
BACHELOR OF BUSINESS ANALYTICS WITH HONOURS

6 FACULTY OF INDUSTRIAL SCIENCES AND TECHNOLOGY

BACHELOR OF APPLIED SCIENCE INDUSTRIAL CHEMISTRY WITH HONOURS
BACHELOR OF APPLIED SCIENCE INDUSTRIAL BIOTECHNOLOGY WITH HONOURS
BACHELOR OF APPLIED SCIENCE MATERIAL TECHNOLOGY WITH HONOURS
BACHELOR OF OCCUPATIONAL SAFETY AND HEALTH WITH HONOURS

7 FACULTY OF MANUFACTURING AND MECHATRONICS ENGINEERING TECHNOLOGY

B.ENG (HONS.) MANUFACTURING ENGINEERING
B.ENG (HONS.) MECHATRONICS ENGINEERING
B.ENG (HONS.) MECHATRONICS ENGINEERING (COLLABORATION PROGRAMME WITH HsKA, GERMANY)
BACHELOR OF ENGINEERING TECHNOLOGY (MANUFACTURING) WITH HONOURS
BACHELOR OF TECHNOLOGY IN INDUSTRIAL MACHINING WITH HONOURS
BACHELOR OF TECHNOLOGY IN WELDING WITH HONOURS
BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (INDUSTRIAL AUTOMATION) WITH HONOURS
BACHELOR OF MECHATRONIC ENGINEERING TECHNOLOGY (ROBOTICS) WITH HONOURS

8 FACULTY OF MECAHNICAL AND AUTOMOTIVE ENGINEERING TECHNOLOGY

B.ENG (HONS.) AUTOMOTIVE ENGINEERING (COLLABORATION PROGRAMME WITH HsKA, GERMANY)
BACHELOR OF TECHNOLOGY IN AUTOMOTIVE WITH HONOURS
BACHELOR IN MECHANICAL ENGINEERING TECHNOLOGY (DESIGN AND ANALYSIS) WITH HONOURS
BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (AUTOMOTIVE) WITH HONOURS
BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (OIL AND GAS) WITH HONOURS

9 FACULTY OF CHEMICAL AND PROCESS ENGINEERING TECHNOLOGY

BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PHARMACEUTICAL) WITH HONOURS
BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PROCESS) WITH HONOURS
BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PETROLEUM) WITH HONOURS
BACHELOR OF TECHNOLOGY IN OIL & GAS FACILITIES MAINTENANCE WITH HONOURS

10 CENTRE FOR MATHEMATICAL SCIENCES

BACHELOR OF APPLIED SCIENCE IN DATA ANALYTICS WITH HONOURS

11 CENTRE FOR HUMAN SCIENCES

12 CENTRE FOR MODERN LANGUAGES

اونيبورسيتي مليسيا ڤهڠ
UNIVERSITI MALAYSIA PAHANG

COLLEGE OF ENGINEERING

UNDERGRADUATE PROSPECTUS 2021/2022

DEPARTMENT OF CHEMICAL ENGINEERING

B.ENG (HONS.)
CHEMICAL ENGINEERING

CONTENTS

CURRICULUM STRUCTURE

B.ENG (HONS.) CHEMICAL ENGINEERING

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND		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	BFI3655 Industrial Training (LI) 10 Weeks	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		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 3rd 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 4th Elective Subjects
	BKC1752 Chemical Engineering Lab I	BKC1333 Thermodynamics	BKC2423 Heat Transfer	BKC2732 Chemical Engineering Lab II	BKC3413 Process Control & Dynamic	BKC***3 1st Elective Subjects		BAA4412 Project Management	
	BEL1113 Fundamental of Electrical Engineering	BKC1323 Organic Chemistry	BFI1203 Material Science	KUK2142 Engineering Economics	BKC3492 Separation Process	BKC***3 2nd 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 Ethnics 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.								

The information provided by College of Engineering are based on University's Regulation and endorsement until 14 May 2020

TOTAL CREDIT FOR GRADUATION	**136**

ELECTIVE COURSES FOR
B. ENG. (HONS.) CHEMICAL ENGINEERING

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
Total Minimum Credits Of Elective Courses For Graduation			**9**

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO	Programme Educational Objectives (PEO)	Performance Indicator
PEO 1	Graduates achieve advanced standing professionally based on their technical expertise and accomplishment related to engineering practices and research, or in other fields they choose to pursue.	60% - Serving in engineering and technical profession 5% - Promoted to senior positions in their organisations
PEO 2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% - Pursuing advanced degree or professional certifications
PEO 3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	60% - Registered with professional bodies 5% - Participating in local community network

PROGRAMME OUTCOMES (PO)

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 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. (Engineering Knowledge)

PO2 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). (Problem Analysis)

PO3 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). (Design/Development of Solutions)

PO4 Conduct investigations of complex 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. (Investigation)

PO5 Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations (WK6). (Modern Tool Usage)

PO6 Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice (WK7). (The Engineer and Society)

PO7 Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development (WK7). (Environment and Sustainability)

PO8 Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7). (Ethics)

PO9 Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings. (Individual and Teamwork)

PO10 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. (Communication)

PO11 Demonstrate knowledge and understanding of engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. (Project Management and Finance)

PO12 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. (Life-long Learning)

COURSE SYNOPSIS

B.ENG (HONS.)
CHEMICAL ENGINEERING (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 & 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 physicals 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 & Computer Aided Design
Credit : 2
Prerequisite : BKC3463 & 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 & 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.

DEPARTMENT OF CIVIL ENGINEERING

B.ENG (HONS.)
CIVIL ENGINEERING

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CURRICULUM STRUCTURE

B. ENGINEERING (HONS.) CIVIL ENGINEERING

YEAR	FIRST			SECOND		THIRD			FOURTH	
SEMESTER	FIRST	SECOND	THIRD	FIRST	SECOND	FIRST	SECOND		FIRST	SECOND
COURSES	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 4015 Industrial Training	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 Geotehcnical 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			
TOTAL CREDIT	**17**	**16**	**1**	**18**	**18**	**16**	**16**	**5**	**14**	**15**
TOTAL CREDIT FOR GRADUATION	**136**									

The information provided by College of Engineering are based on University's Regulation and endorsement until 14 May 2020

ELECTIVE COURSES FOR
B.ENG (HONS.) CIVIL ENGINEERING

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
Total minimum credits of elective courses for graduation			**9**

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO	Programme Educational Objectives (PEO)	Performance Indicator
PEO 1	Graduates achieve advanced standing professionally based on their technical expertise and accomplishment related to engineering practices and research, or in other fields they choose to pursue.	60% - Serving in engineering and technical profession 5% - Promoted to senior positions in their organisations
PEO 2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% - Pursuing advanced degree or professional certifications
PEO 3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	60% - Registered with professional bodies 5% - Participating in local community network

PROGRAMME OUTCOMES (PO)

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 Engineering Knowledge
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 Problem Analysis
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 Design/Development of Solutions
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 Investigation
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 Modern Tool Usage
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 The Engineer and Society
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 Environment and Sustainability
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 Ethics
Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);

PO9 Individual and Team Work
Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;

PO10 Communication
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 Project Management and Finance
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 Life Long Learning
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

COURSE SYNOPSIS B.ENG (HONS.) CIVIL ENGINEERING (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 is 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 & 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.
C04: 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 toEC3 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 produces 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 Hdrology & 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 be 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 covers 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, vibrio 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 equips 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 programing 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.

Couse 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.

DEPARTMENT OF MECHANICAL ENGINEERING

B.ENG (HONS.) MECHANICAL ENGINEERING

CONTENTS

CURRICULUM STRUCTURE

B. ENG. (HONS.) MECHANICAL ENGINEERING

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEM	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
	BUM 2123 Applied Calculus	BUM 2133 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					BMM3995 Industrial Training		

The information provided by College of Engineering are based on University's Regulation and endorsement until 14 May 2020

	for Engineers							
TOTAL CREDIT	**18**	**17**	**17**	**18**	**17**	**21**	**14**	**14**
TOTAL CREDIT FOR GRADUATION	**136**							

ELECTIVE COURSES FOR
B. ENG. (HONS.) MECHANICAL ENGINEERING

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
Total Minimum Credit of Elective Subjects for Graduation			**12**

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO	Programme Educational Objectives (PEO)	Performance Indicator
PEO 1	Graduates achieve advanced standing professionally based on their technical expertise and accomplishment related to engineering practices and research, or in other fields they choose to pursue.	60% - Serving in engineering and technical profession 5% - Promoted to senior positions in their organisations
PEO 2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% - Pursuing advanced degree or professional certifications
PEO 3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	60% - Registered with professional bodies 5% - Participating in local community network

PROGRAMME OUTCOMES (PO)

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 Engineering Knowledge
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 Problem Analysis
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 Design/Development of Solutions
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 Investigation
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 Modern Tool Usage
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 The Engineer and Society
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 Environment and Sustainability
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 Ethics
Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);

PO9 Individual and Team Work
Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;

PO10 Communication
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 Project Management and Finance
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 Life Long Learning
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

BACHELOR OF MECHANICAL ENGINEERING

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 eccentrically 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, fundamental s of CAD software development, fundamental 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 begining 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 ergonomiccally 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.

B.ENG (HONS.) MECHANICAL ENGINEERING (AUTOMOTIVE)

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CURRICULUM STRUCTURE

B. ENG. (HONS.) MECHANICAL ENGINEERING (AUTOMOTIVE)

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEM	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	UGE2002 Technopreneurship	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		

The information provided by College of Engineering are based on University's Regulation and endorsement until 14 May 2020

	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
B. ENG. (HONS.) MECHANICAL ENGINEERING (AUTOMOTIVE)

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

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO	Programme Educational Objectives (PEO)	Performance Indicator
PEO 1	Graduates achieve advanced standing professionally based on their technical expertise and accomplishment related to engineering practices and research, or in other fields they choose to pursue.	60% - Serving in engineering and technical profession 5% - Promoted to senior positions in their organisations
PEO 2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% - Pursuing advanced degree or professional certifications
PEO 3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	60% - Registered with professional bodies 5% - Participating in local community network

PROGRAMME OUTCOMES (PO)

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 Engineering Knowledge
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 Problem Analysis
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 Design/Development of Solutions
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 Investigation
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 Modern Tool Usage
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 The Engineer and Society
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 Environment and Sustainability
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 Ethics
Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);

PO9 Individual and Team Work
Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;

PO10 Communication
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 Project Management and Finance
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 Life Long Learning
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

BACHELOR OF MECHANICAL ENGINEERING (AUTOMOTIVE)

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, fundamental s of CAD software development, fundamental 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

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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 begining 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).

DEPARTMENT OF ELECTRICAL ENGINEERING

B.ENG (HONS.) ELECTRICAL ENGINEERING (POWER SYSTEM)

CONTENTS

CURRICULUM STRUCTURE

B. ENG (HONS.) OF ELECTRICAL ENGINEERING (POWER SYSTEM)

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**		**FIRST**	**SECOND**
COURSES	BEL1113 Fundamental of Electrical Engineering	BEL1123 Circuit Analysis 1	KUK2443 Numerical Methods & Optimization	KUK2142 Engineering Economics	KUK3562 Occupational Safety & Health	KUK3022 Engineers in Society	BEL3715 Industrial Trainig (LI) 10 Weeks	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
	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		BEL4513 Electronic Drives & Applications	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**								

The information provided by College of Engineering are based on University's Regulation and endorsement until 14 May 2020

ELECTIVE COURSES FOR
B.ENG (HONS.) ELECTRICAL ENGINEERING (POWER SYSTEM)

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
Total Minimum Credits Of Elective Courses For Graduation			**12**

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO	Programme Educational Objectives (PEO)	Performance Indicator
PEO 1	Graduates achieve advanced standing professionally based on their technical expertise and accomplishment related to engineering practices and research, or in other fields they choose to pursue.	60% - Serving in engineering and technical profession 5% - Promoted to senior positions in their organisations
PEO 2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% - Pursuing advanced degree or professional certifications
PEO 3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	60% - Registered with professional bodies 5% - Participating in local community network

PROGRAMME OUTCOMES (PO)

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 Engineering Knowledge
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 Problem Analysis
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 Design/Development of Solutions
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 Investigation
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 Modern Tool Usage
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 The Engineer and Society
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 Environment and Sustainability
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 Ethics
Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);

PO9 Individual and Team Work
Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;

PO10 Communication
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 Project Management and Finance
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 Life Long Learning
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

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, bypolar 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 additon, 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 neccessary 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 neccessary 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

<u>Fourth Year Courses</u>

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 referrence 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

DEPARTMENT OF INDUSTRIAL ENGINEERING

BACHELOR OF INDUSTRIAL ENGINEERING WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF INDUSTRIAL ENGINEERING WITH HONOURS

YEAR	FIRST		SECOND		THIRD			FOURTH	
SEMESTER	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**		**FIRST**	**SECOND**
	BFI1101 Intro to Industrial Engineering	BFI1203 Materials Science	BMM2313 Computer Aided Design	BKF1333 Thermodynamics	BMM3323 Mechanical Design	BMM3613 Mechanical Vibrations		BFI4713 Facilities Planning	BFI4813 Production Planning & Control
	BMM1213 Statics	BMM1223 Dynamics	BMM1233 Strength of Materials	BMM3753 Manufacturing Processes	BMM3413 Automatic Control	BFI3613 Ergonomics & Work Design		BFI4723 Operation Research	BFI4823 Industrial Simulation
	BEL1113 Fundamental of Electrical Engineering	BFI1221 Engineering Lab 1	BAA2713 Fluid Mechanics	BMM3423 Measurement & Instrumentation	BFI3543 Quality Engineering	KUK3022 Engineers In Society		BFI4702 Undergraduate Research Project 1	BFI4804 Undergraduate Research Project 2
	KUK1213 Computer Programming for Engineers	BUM2133 Ordinary Differential Equation	KUK2443 Numerical Methods & Optimisation	BFI2421 Engineering Lab 2	BFI3531 Engineering Lab 3	BFI3632 Engineering Lab 4		KUK4412 Project Management	BFI4**3 Industrial Engineering Elective 2
COURSES	BUM2123 Applied Calculus	UHL2422 English for Technical Communication	BUM2413 Applied Statistics	KUK2142 Engineering Economics	BFI3551 Integrated Design Project 1	BFI3623 Integrated Design Project 2	BFI3655 Industrial Trainig	BFI4**3 Industrial Engineering Elective 1	B*****3 Free Elective 2
	UHL2400 Fundamentals of English	UHC1012 Falsafah dan Isu Semasa	UHL2432 English For Professional Communication	BFI2411 Six-Sigma Module 1	BFI3511 Six-Sigma Module 2	BFI3611 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				
					UHE3**2 Elective Social Science				
TOTAL CREDIT	**16**	**17**	**17**	**16**	**17**	**16**	**5**	**16**	**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
Total Minimum Credits Of Elective Courses For Graduation			**12**

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO	Programme Educational Objectives (PEO)	Performance Indicator
PEO 1	Graduates achieve advanced standing professionally based on their technical expertise and accomplishment related to engineering practices and research, or in other fields they choose to pursue.	60% - Serving in engineering and technical profession 5% - Promoted to senior positions in their organisations
PEO 2	Graduates continue to acquire knowledge in technical and non-technical areas in pursuit of life-long learning.	5% - Pursuing advanced degree or professional certifications
PEO 3	Graduates demonstrate commitment to the community and the profession, holding responsible positions that contribute to the well-being of the society.	60% - Registered with professional bodies 5% - Participating in local community network

PROGRAMME OUTCOMES (PO)

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 Engineering Knowledge
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 Problem Analysis
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 Design/Development of Solutions
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 Investigation
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 Modern Tool Usage
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 The Engineer and Society
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 Environment and Sustainability
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 Ethics
Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);

PO9 Individual and Team Work
Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;

PO10 Communication
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 Project Management and Finance
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 Life Long Learning
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

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 metallurgraphy, 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 an 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 issues

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

اونيۏرسيتي مليسيا ڤهڠ
UNIVERSITI MALAYSIA PAHANG

FACULTY OF CHEMICAL AND PROCESS ENGINEERING TECHNOLOGY

UNDERGRADUATE PROSPECTUS 2021/2022

BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PHARMACEUTICAL) WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PHARMACEUTICAL) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**
COURSES	UHL2400 Fundamentals of English Language	UHL2412 English For Academic Communication	UHL2422 English For Technical Communication	UHL2432 English For Professional Communication	UHF21*1 Foreign Language 2	BTK3714 Final Year Project I	BTK4726 Final Year Project II	BTU4812 Industrial Training
	BUF1113 Basic Physics	BUM2113 Applied Mathematics	BUM2413 Applied Statistics	UHF11*1 Foreign Language 1	BTK3112 Project Management	BTF3833 OSH in Pharma Industry	BTF4663 System Validation	
	UHC1012 Falsafah dan Isu Semasa	UGE2002 Technopreneurship	UQ2**1 Co-Curriculum 2	UHC2022 Penghayatan Etika dan Peradaban	BTK3122 Engineering Economy	BTF3652 Contemporary Trends in Pharmaceutical Industry	BTF38**3 Elective 2	
	BUM1223 Calculus	BTK1123 Organic Chemistry	BTK1243 Fluid Mechanics	BTK2243 Material Science and Technology	BTK3274 Process Instrumentation and Control	BTF3243 Bioseparation Technology	BTF38*3 Elective 3	
	UQB1**1 Co-Curriculum 1	BTK2233 Electrical Technology in Chemical Industry	BTK2253 Mass Transfer	BTK2263 Heat Transfer	BTF1623 Manufacturing & Processing Technology	BTF3373 Quality Management System	BTK4112 Internship Preparation	
	UHS1022 Soft Skill	BTK2273 Computer Aided Design	BTK2284 Chemical Reactor Technology	BTK3214 Separation Process I	BTF1143 Pharmaceutical Waste Management	BTF38*3 Elective 1		
	BTK1512 Professional Practice and Ethics	BTK2223 Chemical Process Principles	BTF1213 Microbiology	BTF2232 Contamination Control and Clean Room Technology	BTF2153 Pharmaceutical Formulation Methods			
	BTK1113 Analytical Chemistry			BTF2632 Introduction to Good Manufacturing Practices				
	BTK2213 Computer Programming for Technologist							
	BTK1253 Thermodynamics							
TOTAL CREDIT PER SEMESTER	**19**	**19**	**19**	**19**	**18**	**18**	**17**	**12**
OVERALL TOTAL CREDIT FOR GRADUATION	**141**							

*This curriculum stucture is effective starting from Semester I, 2020/2021.
UHL2400 - Only for students who obtained MUET Band 2.0 and below.
BUF1113 - Only for students who have not taken any Physic or equivalent courses during Matriculation, Diploma or STPM

ELECTIVE COURSES FOR

BACHELOR OF CHEMICAL 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	BTF3843	Utilities Requirement for Pharmaceutical Industry	3
4	BTF3853	Natural Product Development	3
5	BTF3863	Natural Product Commercialization	3
6	BTF3873	Pharmacology	3
7	BTF3883	Biopharmaceutics	3
8	BTF3893	Regulatory Affairs	3
Total minimum credits of elective courses for graduation			9

Nota:
BTF sedang dalam proses peralihan akreditasi dari MQA ke MBOT. Dokumen untuk kelulusan semakan kurikulum telah dihantar ke MQA pada 4 November 2020 dan akan dihantar ke JPT selepas mendapat kelulusan MQA.

COURSE SYNOPSIS

BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PHARMACEUTICAL) WITH HONOURS

BTK1512
Professional Practice and Ethics
Credit Hour: 2
Prerequisite: None

Synopsis

This subject introduces to the students about engineering technologist profession, behaviours, 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 Outcome

CO1: Explain the knowledge in societal, legal and environmental issues in the contexts of engineering technologist.
CO2: Describe the relation of philosophy in term of science, technology and engineering.
CO3: Demonstrate ethical competent, well performed and understand the engineering ethics philosophy.

BTK1113
Analytical Chemistry
Credit Hour: 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 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 Outcome

CO1: Describe the concepts of analytical chemistry and evaluate the analytical data.
CO2: Solve problem related to basic analytical chemistry concepts such as gravimetry and titration.
CO3: Explain the concept and application of analytical equipment such as GC, HPLC, UV-Vis and FTIR
CO4: Practically operate analytical equipment based on the theories learn in class.

BTK2213
Computer Programming for Technologist
Credit Hour: 3
Prerequisite: 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: Identify the programming platform environment, built-in functions, user defined functions, and etc for computer programming in application software.
CO2: Demonstrate basic programming concepts and skills needed for basic problem-solving using application software.
CO3: Demonstrate the ability to execute a functional written computer program and apply it using graphical user interfaces (GUI) as an interactive expression.

BTK1253
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

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.

BTK1123
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

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 synthesize and their applications in team

BTK2233
Electrical Technology in Chemical Industry
Credit Hour: 3
Prerequisite: None

Synopsis

This course is designed to introduce the fundamental of electrical system principles. The underlying principles that will be covered in this course include an introduction to an electrical system, basic laws (Ohm’s law, Kirchhoff laws, current/voltage divider), circuit analysis and electrical hazards. Students are also exposed to the principle of transformer and discuss about typical equipment used in process industries. A part of that, student also needs to carry out a simple project in order to assess their understanding on the basic electrical principles and its applications.

Course Outcome

CO1: Describe the concepts of electrical system and its components as well as awareness on electrical hazards.
CO2: Analyze electrical circuit problems.
CO3: Describe the instrumentation elements for chemical processes.
CO4:Demonstrate the concepts of electrical principle using AC/DC electrical system.

BTK2273
Computer Aided Design
Credit Hour: 3

Prerequisite: None

Synopsis

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.

Course Outcome

CO1: Ability to identify capabilities, limitations and procedures for CAD software.
CO2: Demonstrate knowledge of the usage of CAD software in general technical drawing.
CO3: Ability to use the CAD software in basic and advanced working tools mode for complex technical drawing.
CO4: Apply the CAD software tools in order to create technical drawings for the chemical engineering equipment.

BTK2223
Chemical Process Principles
Credit Hour: 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.

Course Outcome

CO1: Solve the variables and properties related to material and energy balance problems.
CO2: Analyze the material balance of process nonreactive and reactive systems.
CO3: Analyze the energy balance of process nonreactive and reactive systems.
CO4: Able to measure the concepts of mass and energy balance data obtained from the laboratory experiments.

BTK1243
Fluid Mechanics
Credit Hour: 3
Prerequisite: None

Synopsis

This module will introduce students to the principals 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

CO1:Apply the fluid principles, Bernoulli's equation, continuity equation, fluid properties in various applications.
CO2:Analyse the fluid systems in real pipe line systems and fluid machines.
CO3:Measure, determine, perform and interpret the parameters of fluid experiment as a group.

BTK2253
Mass Transfer
Credit Hour: 3
Prerequisite: None

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 Outcome

CO1:Understand the concept of mass transfer in diffusion phenomena in gas, liquid, solid, biological solution and gel system.
CO2: Solve problems related to diffusion and convection mass transfer in steady/unsteady state system.
CO3: Relate the concept of mass transfer in problems related to unit operation/equipment.

BTK2284
Chemical Reactor Technology
Credit Hour: 4
Prerequisite: None

Synopsis

This course introduces the use of process variable, chemical kinetic principles, stoichiometry and conversion variable into the design equation of different types of reactors at ideal condition. The topics covered in this subject are kinetics of homogenous and heterogeneous reactions, classifications of chemical reactions in batch and continuous reactor, including the effects which significantly influence the reactor performance and the study of the real scenario for non-ideal reactors in industries

Course Outcome

CO1: Apply chemistry, thermodynamics and chemical reaction fundamentals such as reactant limitation, mole balance, rate law and stoichiometry in chemical reactor design analysis.
CO2: Explain the factors that affect the performance of industrial reactor such as mixing and other limiting situation for both homogeneous and heterogeneous reactions.
CO3:Relate the use of conversion, selectivity and yield in chemical reactor design.
CO4:Predict the performance of different types of reactor based on experimental data using an appropriate model.
CO5: Display competency in running bench scale and pilot scale reactors.

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

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.

BTP 1133
Material Science and Technology
Credit Hour: 3
Prerequisite: None

Synopsis

This course is designed to provide a knowledge on introductory science and properties of materials. The course emphasized on types of materials and the key factor on materials selection expecially for chemical process plant. Student will understand the properties of composite will varied depending on types of material and material formulation. Standard testing for material is included especially on mechanical properties.Experimental works related to material such as mechanical properties of polymer and metals corrosion are embeded in this course.

Course Outcome

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 technology systems.
CO2:Compare different type of material, material coded and standard material testing.
CO3:Relate the thermal, electric properties of material and corrosion with certain requirement of application.
CO4:Able to explain the performance of the tested material based on the experimental data.

BTK2263
Heat Transfer
Credit Hour: 3
Prerequisite: None

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 Outcome

CO1:Solve problems related to the heat transfer principles and fundamentals in steady state and unsteady state.
CO2:Apply the concept of heat transfer in problems related to unit operation/ equipment (heat exchanger).
CO3:Analyze the principle of heat transfer individually and in team.

BTK3214
Separation Process I
Credit Hour: 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 and liquid-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 Outcome

CO1:Apply knowledge of chemical engineering fundamentals such as mass transfer, heat transfer, materials and energy balance to the major unit operation.
CO2:Determination of equipment specification and sizing.
CO3: Conduct laboratory scale separators by considering appropriate methodology and safety.

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

CO1: Introduction and basic concepts of clean room and contamination control
CO2:Principles, problems and equipment related to clean room and contamination control
CO3:Ability to present as individuals in matters related to contamination control and cleanroom concepts
CO4:Defend with presentation in matters related to contamination control and cleanroom concepts

BTF2632
Introduction to Good Manufacturing Practices
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 on understanding about quality control, quality assurance, validations, complaints, training and documentation in the pharmaceutical manufacturing industry.

Course Outcome

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.

BTK3274
Process Instrumentation and Control
Credit Hour: 4
Prerequisite: None

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

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.

BTF1623
Manufacturing & Processing Technology
Credit Hour: 3
Prerequisite: None

Synopsis

This course is designed to provide the student with an understanding of the equipment unit processes used in pharmaceutical industry and the organization of pharmaceutical manufacturing plant.

Course Outcome

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:Measure in-process quality control (IPQC) and operating parameters with regard to formulation & filling and plant utilities (i.e. HVAC, compressed air & PW)
CO5:Defend theories and prioritize time effectively to meet the needs of organization

BTF1143
Pharmaceutical Waste Management
Credit Hour: 3
Prerequisite: None

Synopsis

The primary objective of the course is to give students a foundation of knowledge and understanding of waste management. The course presents concept and techniques for testing and analysis of the waste. Practical experiments in the laboratory will also be conducted. Students will be exposed to the water & wastewater analysis, air pollution control and solid waste management

Course Outcome

CO1:Categorize different type of pollutants
CO2:Describe the detection techniques used in environmental quality management
CO3:Explain the principle and unit operation used for the treatment of pollutant
CO4:Demonstrate the evaluation and detection method used for treatment of water, wastewater, air and solid waste
CO5:Perform the environmental and sustainability code and practice to the society

BTF2153
Pharmaceutical Formulation Methods
Credit Hour: 3
Prerequisite: BTK1123 Organic Chemistry

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

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

BTK3714
Final Year Project I
Credit Hour: 4
Prerequisite: None

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. Each student will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor). 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 Outcome

CO1:Propose the project proposal on a chosen/given topic in the relevant area.
CO2: Defend project proposal in 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

BTF3833
OSH in Pharmaceutical Industry (Elective)
Credit Hour: 3
Prerequisite: None

Synopsis

This course 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 to 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

CO1:Differentiate legislative requirement, professional and ethical responsibility pertaining to safety and health in the 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

BTP 3652
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

CO1:Organize new regulatory requirements to a pharmaceutical industry
CO2: Confirmation of new technical guides to manufacturing plant and equipment design management system
CO3:Express the effectiveness of new management systems to pharmaceutical manufacturing
CO4:Defend with presentation in matters related to interpretation and applications of new regulatory systems
CO5: Maintain the code of practice in report writing

BTP3243
Bioseparation Technology
Credit Hour: 3
Prerequisite: None

Synopsis

This course aims to provide the students with the theoretical and practical fundamentals of the technology of the biological product separation. The course focuses on providing understanding of bioseparation processes of four RIPP phases which are recovery, isolation, purification and polishing

Course Outcome

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

BTF3373
Quality Management System
Credit Hour: 3
Prerequisite: None

Synopsis

Quality management system in pharmaceutical industries, is an important subject because the drugs / or pharmaceutical products are directly delivered to the customers body system, thus identity, purity safety and ultimately appropriate quality of product are strongly essential.

Course Outcome

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.

BTK4726
Final Year Project II
Credit Hour: 6
Prerequisite: BTK3714 FYP 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

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 the technical paper 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.

BTP 4663
System Validations
Credit Hour: 3
Prerequisite: None

Synopsis

This module aims to provide students with insights about the processes of validation in 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 to accepted standards of Good Manufacturing Practice (GMP). This will provide the students with a good basic to construct validation protocols and implement them appropriately at the workplace.

Course Outcome

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
CO4: Defend the ideas of the selection validation process

BTK4912
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 and 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 Outcome

CO1:Initiate effort to apply acquired technical skill for problem solving in the industry.
CO2:Demonstrate a professional commitment and responsibilities at workplace.
CO3: Present the outcomes of industrial training in a formal oral presentation.
CO4: 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

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 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 forms such as emulsion, suspension, ointment, cream etc.

Course Outcome

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 presentation related to materials processes and colloidal science

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 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 system.

Course Outcome

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 begins from authentication, extraction, formulation and registration of products.

Course Outcome

CO1:Compare the chemical and analytical processes in establishing a prominent lead compound involve 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 target.
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

CO1:Determine the characteristics of the corresponding products that are marketable and challenge 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 meeting 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 and etc.

Course Outcome

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

CO1:Analyze the principles of pharmacokinetics that underlie the absorption, distribution, metabolism and elimination of drugs in the body.
CO2:Evaluate the effects of physiological factors and variability of pharmacokinetics parameters towards drug disposition within body.
CO3:Outline the biopharmaceutics considerations and impacts of Quality Drug Products to pharmaceutical industry
CO4:Express ideas related to biopharmaceutics and pharmacokinetics.

BTF3893
Regulatory Affairs (Elective)
Credit Hour: 3
Prerequisite: BTF2632 Introduction to Good Manufacturing Pratices

Synopsis
This module aims to provide the student with a detailed understanding of the requirements of the Good manufacturing practice (GMPs), GMP guidelines around the globe, basic concepts of validation, management of validation program, validation in pharmaceuticals specifically and being introduced to the post-marketing issues.

Course Outcome

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 pharmaceutical industry.

BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PROCESS) WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PROCESS) WITH HONOURS

Bachelor of Chemical Engineering Technology (Process) with Honors

First Year		Second Year		Third Year		Fourth Year	
18	19	19	18	19	18	18	12
BTK1113	BTK1163	BTK1243	BTK2263	BTK3274	BTK3714	BTK4726	
Analytical Chemistry	Organic Chemistry	Fluid Mechanics	Heat Transfer	Process Instrumentation and Control	Final Year Project I	Final Year Project II	
BTK2213	BTK2233	BTK2253	BTK3214	BTK3273	BTK3233	BTK4224	
Computer Programming for Technologist	Electrical Technology in Chemical Industry	Mass Transfer	Separation Process I	Environmental & Sustainable Technology	Process Modelling and Simulation	Plant Troubleshooting and Maintenance	BTK4912 Industrial Training
BTK1253	BTK2273	BTK2284	BTK1263	BTK3263	BTK4214	BTK38*3	
Thermodynamics	Computer Aided Design	Chemical Reactor Technology	Static & Strength of Materials	Separation Process II	Plant Automation	Elective III	
BTK1152	BTK2223	BTK3243	BTK2243	BTK3224	BTK38*3	BTK38*3	
Professional Practice and Ethics	Chemical Process Principles	Chemical Plant Safety	Materials Science and Engineering	Plant Utilities	Elective I	Elective IV	
UHR1012	UGE2002	UHL2422	UHL2432	BTK3112	BTK38*3	BTK4112	
Islamic and Asian Civilisations	Technopreneurship	English for Technical Communication	English for Professional Communication	Project Management	Elective II	Internship Preparation	
BUM1223	UHL2412	BUM2413	UHM2022	BTK3122	UHF2021		
Calculus	English For Academic Communication	Applied Statistics	Ethnic Relations	Engineering Economics	Foreign Language II		
UQB1__1	BUM2113	UQ2__1	UHS2021	UHF1011			
Co-Curriculum I	Applied Mathematics	Co-Curriculum II	Soft Skills II	Foreign Language I			
UHS1011							
Soft Skills I							

Elective Courses
BTK3813
Petroleum Refining & Petrochemical Technology (E)
BTK3823
Bioprocess Technology (E)
BTK3843
Food Engineering Technology (E)
BTK3853
Oleo Chemical Technology (E)
BTK3873
Operation Management (E)
MKK1313
Chemical Product Design & Management (E)

ELECTIVE COURSES FOR
BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PROCESS) WITH HONORS

No	Code	Course	Credit Hour
1	BTK3873	Operation Management	3
2	BTK3843	Food Engineering Technology	3
3	BTK3853	Oleo Chemical Technology	3
4	BTK3813	Petroleum Refining & Petrochemical Technology	3
5	BTK3823	Bioprocess Technology	3
6	MKK1313	Chemical Product Design & Management	3
		Total Credit Hours (4 Courses)	**12**

Nota: Struktur terkini telah mendapat Perakuan Akreditasi Sementara merujuk Siaran keputusan Mesyuarat Jawatankuasa Akreditasi (MJA) Bil. 10/2020 bertarikh 27 Oktober 2020 pada paparan laman web MQA.

COURSE SYNOPSIS

BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PROCESS) 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 be assigned in group to analyze 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 operate analytical equipment based on the theories learn in class

BTK1152
Professional Practice & Ethics

Synopsis

This subject introduces to the students about engineering technologist profession, behaviors, 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

CO1 Explain the knowledge in societal, legal and environmental issues in the contexts of engineering technologist.
CO2 Describe the relation of philosophy in term of science, technology and engineering.
CO3 Demonstrate ethical competent, well performed and understand the engineering ethics philosophy

BTK2213
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 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 execute a functional written computer program and apply it using graphical user interfaces (GUI) as an interactive expression.

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 Demonstrate 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 focus on the key concepts of organic chemistry through a study of the reactions of selected non-functional 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

BTK2233
Electrical Technology in Chemical Industries

Synopsis

This course is designed to introduce the fundamental of electrical system principles. The underlying principles that will be covered in this course include an introduction to an electrical system, basic laws (Ohm's law, Kirchhoff laws, current/voltage divider), circuit analysis and electrical hazards. Students are also exposed to the principle of transformer and discuss about typical equipment used in process industries. A part of that, student also needs to carry out a simple project in order to assess their understanding on the basic electrical principles and its applications.

Course Outcomes

CO 01 Describe the concepts of electrical system and its components.
CO 02 Analyze electrical circuit problems.
CO 03 Analyze bridge circuit for instrumentation.
CO 04 Demonstrate the concepts of electrical principle using AC/DC electrical system and circuit simulator.

BTK2273
Computer Aided Design

Synopsis

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.

Course Outcomes

CO 01 Ability to identify capabilities, limitations and procedures for CAD software.
CO 02 Ability to use the CAD software in basic and advanced working tools mode for complex technical drawing.
CO 03 Apply the CAD software tools in order to create technical 3D drawings for chemical

engineering equipment.

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. In addition, computer application using MS Excel to solve the material and energy balance also imbedded in this course.

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

BTK1243
Fluid Mechanics

Synopsis

This module will introduce students to the principals 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 Analyze the fluid systems in real pipeline systems and fluid machines.
CO 03 Determine the parameters of fluid experiment as a group.

BTK2253
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 Understand 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 Apply the concept of mass transfer in problems related to unit operation/equipment.

BTK2284
Chemical Reactor Technology

Synopsis

This subject covers the knowledge of the reaction kinetics and reactor design. The course introduces the basic design calculation and design of chemical reactors at the ideal conditions. The topics covered in this subject are kinetics of homogenous and heterogeneous reactions, chemical reactions in batch and continuous reactor, multiple reactions, including the effects which significantly influence the reactor performance and the study of the real scenario for non-ideal reactors in industries.

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.

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 to 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 incidents and propose 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.

BTK1263
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 body, distributed forces, analysis of structure, friction, stress and strain for axial forces, shear forces & bending moments in beam and torsion. 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 Analyze problems involving the equilibrium of a rigid and deformable bodies and use the fundamental principles in statics to solve them.
CO 03 Analyze the internal forces, moment and deformation in materials resulting from the axial stress and strain.
CO 04 Demonstrate the relationship between material behavior and properties via experimental work and laboratory report

BTK2243
Materials Science and Engineering

Synopsis

This course is designed to provide a knowledge on introductory science and properties of materials. The course emphasized on types of materials and the key factor on materials selection especially for chemical process plant. Student will understand the properties of composite will varied depending on types of material and material formulation. Standard testing for material is included especially on mechanical properties. Experimental works related to material such as mechanical properties of polymer and metals corrosion are embedded in this course.

Course Outcomes

CO 01 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 technology systems.
CO 02 Compare different type of material, material coded and standard material testing.
CO 03 Relate the thermal, electric properties of material and corrosion with certain requirement of application
CO 04 Able to evaluate the performance of the tested material based on the experimental data.

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 Solve 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 Analyze the principle of heat transfer individually and in team

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 design parameters of the selected unit operations such as evaporation, distillation, absorption, liquid extraction and leaching.

Course Outcomes

CO 01 Apply knowledge of chemical engineering fundamentals such as mass transfer, heat transfer, materials and energy balance to the major unit operation.
CO 02 Determination of equipment specification and sizing
CO 03 Conduct laboratory scale separators by considering appropriate methodology and safety.

BTK3112
Project Management

Synopsis

This course deals with cost analysis in engineering decision-making, the management aspects and control of complex projects. Project management topics include knowledge on roles and responsibilities, planning, organization, time, cost, risk and quality management.

Course Outcomes

CO 01 Discuss the need of chemical engineering graduates when they have to make financial decisions as a team member or project manager
CO 02 Apply basic project management concepts and principles through case study.

BTK3122
Engineering 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.

Course Outcomes

CO 01 Explain theoretical and conceptual basis on which the practice of engineering economics project analysis is built.
CO 02 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.

BTK3224
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 trouble-shoot the unit operations that supply the utilities.

Course Outcomes

CO 01 Initiate effort to apply acquired technical skill for problem solving in the industry.
CO 02 Demonstrate a professional commitment and responsibilities at workplace.
CO 03 Present the outcomes of industrial training in a formal oral presentation.

BTK3273
Environmental & Sustainable Technology

Synopsis

This subject is designed to introduce to the students the principle of environmental technology and current environmental problems. Topics includes water pollution, wastewater quality management, wastewater treatment, air, noise, solid waste treatment and management. 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 Outcomes

CO 01 Identify the effect of pollutants on the environment (atmosphere, water, soil)
CO 02 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.
CO 03 Analyze the methods involved in management of solid, air, and hazardous waste.
CO 04 Evaluate the impact of pollution to the surrounding environment and the society

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 design parameters associated with every unit operation.

Course Outcomes

CO 01 Determine basic design parameters associated with drying, adsorption, membrane separation process, crystallization and mechanical-physical separation.
CO 02 Apply the concept and solve problems related to drying, adsorption, membrane separation process, crystallization and mechanical-physical separation.
CO 03 Ability to 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 needed in modern industrial processes for a business to remain profitable. It improves product quality, reduces plant emissions, minimizes human error, and reduces operating costs among many other benefits. In this course students are introduced to the basic and application of PI&C. Topics that will be covered include introduction to process control, P&ID drawing, instrumentation devices and process safety systems as well as development of control systems using LabView. Students will be exposed to both theoretical and practical knowledge for better understanding of this course.

Course Outcomes

CO 01 Explain the basic control system and different types of field instrumentations and its applications in process industries, as well as control systems.
CO 02 Perform 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 Adapt team working and commitment behavior

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. Each student will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor). 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 Classify relevant information independently and demonstrate curiosity in exploring new information

BTK3233
Process Modelling and Simulation

Synopsis

This course will introduce the usage of process simulation and flow sheeting software; Aspen Plus/Aspen HYSYS to students. This software will be used to simulate steady state chemical engineering and other related processes which includes gas, liquid and solid processing. This subject is important to prepare students for future usage of the advanced modelling tool in chemical engineering and other related fields involving process design and simulation.

Course Outcomes

CO 01 Develop flowsheet to model and simulate problems related to chemical engineering unit operations.
CO 02 Simulate steady-state chemical engineering processes which includes gas, liquid and solid processing.
CO 03 Perform sensitivity analysis and optimization of chemical engineering processes

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 behavior.
CO 02 Analyze feedback process control, PID design and tuning.
CO 03 Practice 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 FYP 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 Execute project according to the proposed research plan, schedule and estimated cost and solve the problems by using appropriate tools
CO 03 Discuss 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 Engage in life-long learning enhancing individual's soft skill through research activities
CO 07 Function 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 Evaluate the reliability of processing plant through various strategies to ensure smooth plant operations
CO 03 Assess the operations major process equipments and its common operating problems

BTK4112
Internship Preparation

Synopsis

This course intended to prepare students to industrial preparation and the environment of how the industry work. The safe work in place is being deliver here for the safety propose.

BTK4912
Industrial Training

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 university supervisor, as a complement to their degree.

Course Outcomes

CO 01 Initiate effort to apply acquired technical skill for problem solving in the industry.
CO 02 Demonstrate a professional commitment and responsibilities at workplace.
CO 03 Present the outcomes of industrial training in a formal oral presentation.
CO 04 Conduct an analysis 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 condition and operation in 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 simulator 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 bioprocessing industry, emphasize on the application of transport phenomena in bioreactor, scale up, monitoring and control of bioreactor. The topics include introduction of the unit operations that 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. Student also will be taught to identify the current problem in food industry. Plant site visit and case studies in food industries also will be done by student 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

BTK3853
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 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

MKK1313

Chemical Product Design & 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, and manufacturing. Several case studies in the chemical product design are presented with special emphasis on the specialty and fine chemicals.

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 chemical

BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PETROLEUM) WITH HONOURS

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CURRICULUM STRUCTURE

BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PETROLEUM) WITH HONOURS

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SHE in Petroleum Industry</td><td>BTK3274
Process Instrumentation and Control</td><td>BTO3214
Well Drilling & Completion</td></tr>
<tr><td>BTK1113
Analytical Chemistry</td><td rowspan="2">UGE2002
Technopreneurship</td><td rowspan="2">BTO1133
Introduction to Petroleum Technology</td><td rowspan="2"></td><td>BTO3114 Formation & Reservoir Technology</td><td rowspan="2">BTO4714
Petroleum Refining and Gas Processing</td></tr>
<tr><td>BTK1253
Thermodynamics</td><td>BTO3124
Environmental & Waste Technology</td></tr>
<tr><td>TOTAL CREDIT PER SEMESTER</td><td>17</td><td>19</td><td>19</td><td>19</td><td>19</td><td>18</td><td>18</td><td>12</td></tr>
<tr><td>141</td><td colspan="8">OVERALL TOTAL CREDIT FOR GRADUATION</td></tr>
</table>

ELECTIVE COURSES FOR
BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PETROLEUM) WITH HONOURS

No	Code	Course	Credit Hour
1	BTO3713	CFD For Engineering Applications ('E)	3
2	BTO3723	Well Testing and Pressure Transient Analysis ('E)	3
3	BTO3733	Reservoirs, Resources and Reserves ('E)	3
4	BTO3873	Liquefied Natural Gas ('E)	3
5	BTO3823	Energy Reserve and Enhance Oil recovery ('E)	3
6	BTO3833	Operation & Engineering Economic ('E)	3
7	BTO3843	Optimal Liquefied Natural Gas (LNG) Operation ('E)	3
		Total Credit Hours (3 Courses)	**9**

Nota:
BTO sedang dalam proses peralihan akreditasi dari MQA ke MBOT. Dokumen untuk kelulusan semakan kurikulum telah dihantar ke MQA pada 4 November 2020 dan akan dihantar ke JPT selepas mendapat kelulusan MQA.

COURSE SYNOPSIS

BACHELOR OF CHEMICAL ENGINEERING TECHNOLOGY (PETROLEUM) WITH HONOURS

BTK1163
Organic Chemistry
Credit : 3

Synopsis

This course discuss 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. This course focuses on the key concepts of organic chemistry through a study of the reactions selected nonfunctional aliphatic, alicyclic, cyclic and aromatic molecules. Particular emphasis is placed on the underlying mechanistic pathway that are involved and their stereo chemical consequences. The stereochemistry of the molecular structure is also considered.

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 chemicals reactions and steps of mechanism for the synthesis and transformation of functional group.
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.

BTK1152
Professional Practice and Ethics
Credit : 2

Synopsis

This subject introduces the students about personality particulars and behaviors. Those are very important in their careers as engineer technologist, as well as their services given by them to other people, especially their local community. The topics that will be included in this subject are the importance, professionalism, ethics, communication, management, contribution and philosophy of engineering technologidt that should be implemented in their work, to ensure their engineering services give positive impacts in social aspects. By completing this subject, students should practice themselves as competent and versatile professional engineers, at least to be respected and appreciated among their communities, societies and countries.

Course Outcomes

CO1 Explain knowledge of economic, industrial and social contexts of engineering technologist.
CO2 Describe the relation of philosophy in term of science, technology and engineering.
CO3 Demonstrate ethical competent, well-performed and well-servicing people in their career and to their communities and countries.

BTK1243
Fluid Mechanics
Credit : 3

Synopsis

The objective of this course is to introduce the concept and use of fluid mechanics, both static and dynamics fluid. 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 Outcomes

CO1: Recognize and describe the fundamentals of fluid mechanics
CO2: Apply the concept of fluid mechanics to overcome chemical engineering problems
CO3: Analyze and find solutions to problems related to fluid mechanics

BTK1113
Analytical Chemistry
Credit : 3

Synopsis

The syllabus covers the basic knowledge and application of sample and data handling, calibration techniques and quality of analysis in analytical laboratory. It also deals with separation techniques and its basis application such as solid phase extraction, GC and HPLC. The introduction to the theory and application of spectroscopic techniques used in chemical analysis such as UV-Vis, FT-IR, MS and AAS are discussed. The combinations of above techniques with their advantages are covered in this course.

Course Outcomes

CO1: Explain and describe the theory and application of analytical chemistry.
CO2: Interpret and analyze the analytical data.
CO3: Solve the problems related to analytical chemistry.
CO4: Explain the concept and application of analytical equipment such as: GC, HPLC, FTIR, UV-Vis and AAS.

BTK1263
Static & Strength of Materials
Credit : 4

Synopsis

This course is an overview of the study and analysis of forces and loading conditions applied to structures and mechanical devices. An introduction to methods used to determine internal stresses present in machine parts when subjected to various loading conditions. Topics include: simple stresses, centroids, moments of inertia, torsion, shear and bending stresses. Upon completion, students should be able to analyze forces and the results of stresses and strains on structural components.

Course Outcomes

CO1 Establish an understanding of the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behavior.
CO2 Provide students with exposure to the systematic methods for solving engineering problems in solid mechanics.
CO3 Discuss the basic mechanical principles underlying modern approaches for design of various types of structural members subjected to axial load, torsion, bending, transverse shear, and combined loading.
CO4 Demonstrate use of critical thinking and problem solving techniques as applied to mechanical and structural systems.

BTO1133
Introduction to Petroleum Technology
Credit : 3

Synopsis

This course refers to the exploration, extraction and production of petroleum. It focuses on the methods, concepts and applications that are used in the various processes related to petroleum engineering. This course also briefly discusses the operation and equipment used in drilling, well completion and transportation of petroleum. On top of that, accidents related to petroleum engineering also will be covered.

Course Outcomes

CO1 Illustrate components related to petroleum Technology.
CO2 Define the processes involved in production of petroleum.
CO3 Relate industrial practices with components of petroleum technology.

BTK1253
Thermodynamics
Credit : 3

Synopsis

This course is designed to introduce basic concept in thermodynamic in a thorough way. Topics cover are properties of pure substances, thermodynamics system, heat transfer through conduction, convection and radiation, 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: Discover the state of properties from property diagram and obtaining data from property table.
CO2: Solve energy balance (heat, mass and work) of a process for both closed and open system by using the first law of thermodynamics and the concept of entropy through its reversible and irreversible processes.
CO3: Analyze the thermal efficiency of heat engine, heat pump, and refrigerator and Carnot cycle using Second Law of Thermodynamics

BTK 2213
Computer programming for Technologist

Credit : 4

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

CO1: Understand the programming platform environment, build in functions, user defined functions, and etc for computer programming in MATLAB.
CO2: Describes basic programming concepts and skills needed for basic problem solving using MATLAB software
CO3: Demonstrate the ability to execute a functional written computer program and apply it using graphical user interfaces (GUI) as an interactive expressions

BTK2223
Chemical Process Principles
Credit : 3

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 application using MS Excel to solve the material and energy balance also imbedded 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 process nonreactive and reactive systems.
CO3 Analyze and solve energy balance of process nonreactive and reactive systems
CO4 Analyze and solve flow sheet for a pre-determined chemical processes

BTK2233
Electrical Technology in Chemical Industry
Credit : 3

Synopsis

This course is designed to introduce the fundamental of electrical system principles. The underlying principles that will be covered in this course include an introduction to an electrical system, basic laws (Ohm's law, Kirchhoff laws, current/voltage divider), circuit analysis and electrical hazards. Students are also exposed to the principle of transformer and discuss about typical equipment used in process industries. A part of that, student also needs to carry out a simple project in order to assess their understanding on the basic electrical principles and its applications

Course Outcomes

CO1: Describe the concepts of electrical system and its components as well as awareness on electrical safety.
CO2: Analyze and solve electrical circuit problems.
CO3: Demonstrate the concepts of electrical principle and functional study of typical equipment used in process industries

BTK2253
Mass Transfer
Credit : 3

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

CO1 Understand, explain, discuss and solve problems of mass transfer in diffusion phenomena in gas, fluid and solid system

CO2 Apply fundamental understanding 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 operation/equipment.
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BTK2263
Heat Transfer
Credit : 3

Synopsis

This 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

CO1 Understand, explain, discuss and solve problems related to the heat transfer principles and fundamentals in steady state.
CO2 Understand, explain, discuss and solve problems related to the heat transfer principles and fundamentals in unsteady-state.
CO3 Relate the concept of heat transfer in problems related to unit operation/ equipment (heat exchanger).

BTK2273
Computer Aided Design
Credit : 3

Synopsis

This course is introducing the usage of CAD software, AUTOCAD and Aspen Plus as a powerful engineering tool specialized in technical drawing and process simulation in chemical engineering applications. For AUTOCAD, student 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. Meanwhile, for Aspen Plus, student will be exposed and be familiar with the software interfaces and apply the usage for selected chemical engineering processes

Course Outcomes

CO1: Ability to identify capabilities, limitations and procedures for CAD software.
CO2: Demonstrate knowledge of the usage of CAD software in general technical drawing and process simulation.
CO3: Ability to use the CAD software in basic and advanced working tools mode for complex technical drawing and basic process simulation..
CO4: Apply the CAD software tools in order to create technical drawings for the chemical engineering equipment and simulate selected chemical engineering processes

BTK2284
Chemical Reactor Technology
Credit : 4

Synopsis

This subject covers the knowledge of the reaction kinetics and reactor design. The course introduces the basic design calculation and design of chemical reactors at the ideal conditions. The topics covered in this subject are kinetics of homogenous and heterogeneous reactions, chemical reactions in batch and continuous reactor, multiple reactions, including the effects which significantly influence the reactor performance and the study of the real scenario for non-ideal reactors in industries

Course Outcomes

CO1 Apply chemistry, thermodynamics and chemical reaction fundamentals such as reactant limitation, mole balance, rate law and stoichiometry in reactor design
CO2 Explain the factors that affect the performance of industrial reactor such as diffusion, mixing and other limiting situation for both homogeneous and heterogeneous reactions
CO3 Design reactors based on desired conversions, selectivity and yield.
CO4 Predict the non-ideal reactor performance based on the residence time distribution data using an appropriate model.

BTK3214
Separation Process I
Credit : 4

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 design parameters of the selected unit operations such as evaporation, distillation, absorption, liquid extraction and leaching.

Course Outcomes

CO1 Apply knowledge of chemical engineering fundamentals such as mass transfer, heat transfer, materials and energy balance to the solution of unit operation problems
CO2 Identify type of separation processes and analyze the unit operation problems to obtain number of stages and separator sizing.
CO3 Conduct and perform laboratory scale separators by considering appropriate methodology, safety and environment

BTO1214
Geosciences & Petroleum Exploration Credit : 4

Synopsis

This course provides understanding and the importance of geoscience in petroleum exploration. It covers basic geology, formation of petroleum system, and techniques used in petroleum exploration. A case study also provides a good understanding and enhance the student's knowledge in this course.

Course Outcomes

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 project/case study.

BTK3253
Process Management and Economics
Credit : 3

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

CO1 Discuss the need of chemical engineering graduates when they have to make financial decisions as a team member or project manager.
CO2 Explain theoretical and conceptual basis on which the practice of engineering economics project analysis is built.
CO3 Apply basic project management concepts and principles through case study.
CO4 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

BTO3143
SHE in Petroleum Industry
Credit : 3

Synopsis

This course is primarily to expose students with the fundamental concepts, practical aspects and applications of occupational safety and health (OSH) in process industries. Among others, the students will be taught the fundamental application and day-to-day aspects of OSH and at the same time, the management aspects of it. Local and international regulations related to SH&E such as OSHA and FMA will also be covered. Major accident’s case studies and lesson learnt will also be discussed in details.

Course Outcomes

CO1: Value fundamentals of technical safety in process industries.
CO2: Explain the various features of OSH management and regulations. Explain the various features of OSH management and regulations
CO3: Evaluate OSH aspects in the design and operation of process industries
CO4: Review and analyze the cause and effects of industrial incidents and propose for improvement.

BTO3124
Environmental & Waste Technology
Credit : 4

Synopsis

This subject is designed to introduce to the students the principle of environmental technology and current environmental problems. Topics includes water pollution, wastewater quality management, wastewater treatment, air, noise, solid waste treatment and management. 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 Outcomes

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

BTO3114
Formation & Reservoir Technology
Credit : 4

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; formation evaluation. The course will be focusing more on practical application of science and engineering to a wide range of real-world reservoir engineering problems.

Course Outcomes

CO1 Understand the main terminology, concepts and techniques of reservoir engineering technology, petrophysical and fluid properties.
CO2 Analyse and evaluate single and multi-phase fluid flow, material balance, and forecasting.
CO3 Apply the fractional flow theory, strategies and displacement performance calculations to the primary, secondary and enhanced oil recovery.
CO4 Evaluate the reservoirs for potential hydrocarbons and to determine the value of those hydrocarbon reserves.

BTR3274
Process Instrumentation and Control
Credit : 4

Synopsis

Process Instrumentation and Control (PI&C) is needed in modern industrial processes for a business to remain profitable. It improves product quality, reduces plant emissions, minimizes human error, and reduces operating costs among many other benefits. In this course students are introduced to the basic and application of PI&C. Topics that will be covered include introduction to process control, P&ID drawing, instrumentation devices and process safety systems as well as development of control systems using LabView. Students will be exposed to both theoretical and practical knowledge for better understanding of this course.

Course Outcomes

CO1: Explain the basic concept of process instrumentation and control (I&C) and its symbols, identify different types of field instrumentations, control and safety systems, and explain its advantages and disadvantages as well as its applications in process industries
CO2: Demonstrate the ability to construct P&ID and evaluate suitable instruments for a particular process or equipment.
CO3: Construct a functional PI&C system through integration of systems engineering software i.e. LabView.

BTO3214
Well Drilling & Completion
Credit : 4

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 Outcomes

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.

BTO4714
Petroleum Refining and Gas Processing Credit : 4

Synopsis

This course provides students with fundamental technologies of petroleum refining and gas processing. These two plants will produce fuels and feedstocks for chemical industries. For a refinery plant, it involves physical and chemical (thermal and catalytic) processing steps such as ADU, VDU, FCC, HC, HT and etc. For a gas processing plant, it comprises systems such as DHU, AGRU, LTSU and PRU, as to make the gas as per specifications. Additionally, theoretical knowledge will be enhanced by having ASPEN HYSYS process simulation and optimization in the computer laboratory. This course is conducted through lectures, assignments, computer simulations and presentations.

Course Outcomes

CO1: Describe the functions and overall value chain of petroleum refinery and gas processing plants.
CO2 Justify the necessities of each of the unit operation in a refinery plant and perform related calculations.
CO3 Justify the necessities of each of the unit operation in a gas processing plant and perform related calculations.
CO4 Evaluate and improve operational performance of refinery and gas processing plants using ASPEN HYSYS.

BTK3714
Final Year Project I
Credit : 4

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. Each student will be supervised by at least one lecturer or two lecturers (main supervisor and co-supervisor). 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

CO1: To identify and analyse broadly-defined research problems using the principles of mathematics, natural sciences or engineering science.
CO2: To design and develop solutions based on broadly-defined research problems
CO3: 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.
CO4: . To communicate effectively on research outcomes with the engineering community and society (oral/ written)

BTK4716
Final Year Project II
Credit : 6

Synopsis

This subject is the continuation of the subject FYP 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

CO1: To apply knowledge of mathematics, natural sciences, engineering fundamentals or engineering specialization to the research problems.
CO2: To identify and analyse broadly-defined research problems using the principles of mathematics, natural sciences or engineering science.
CO3: To design and develop solutions based on broadly-defined research problems.
CO4: To conduct investigation on broadly-defined research problems including design of experiments, analysis and data interpretation, and conclusion.
CO5 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.
CO6 To communicate effectively on research outcomes with the engineering community and society (oral & written)

BTK4912
Industrial Training
Credit : 12

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 6 months 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 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.

BACHELOR OF TECHNOLOGY IN OIL & GAS FACILITIES MAINTENANCE WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF TECHNOLOGY IN OIL AND GAS FACILITIES MAINTENANCE WITH HONOURS

YEAR	FIRST		SECOND		THIRD			FOURTH
SEMESTER	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**SHORT SEM**	**FIRST**
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	BVF 2**4 Elective 2	BVF 3**4 Elective 4	BVF 32*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		
	UQB1011 Co-Curiculum I (Briged Siswa)	UQ*2**1 Co-Curiculum Ii	UHL2452 English For Vocational Purposes	UHF2111 Mandarin Language 2				
	UHS1022 Soft Skills (Kemahiran Insaniah)	UHL2442 Essential English	UHF1111 Mandarin Language 1					
	UHR 1012 Islamic And Asian Civilisations 1	UHC2022 Penghayatan Etika Dan Peradaban						
	UHC1012 Falsafah Dan Isu Semasa							
TOTAL CREDIT	**19**	**19**	**17**	**16**	**15**	**16**	**6**	**12**
TOTAL CREDIT FOR GRADUATION	**120 (DKM/ DVM)**							

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
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
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	BVF3**3	General elective (organizational behaviour or industrial psychology)	3
Total minimum credits of elective courses for graduation			**27**

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 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, student 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 technologist, the profession and its requirement in Malaysia scenario. Topics that will be included ethics, management and contribution of technologist 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 the technopreneurship being introduce to prepare student the basic understanding on technoprenuer..

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 chemicals reactions and steps of mechanism for the synthesis and transformation of functional group.
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 the 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 knowledge of economic, industrial and social contexts of engineering technologist.
CO2 Describe the relation of philosophy in term of science, technology and engineering.
CO3 Demonstrate ethical competent, well-performed and well-servicing people in their career and to their communities and countries.

BVF1143
Technical Drawing & CAD
Credit: 3

Synopsis

This course is introducing the usage of technical drawing as a standard and precise ways to communicate the engineering ideas. Student 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 and etc in technical drawing will also be covered. Meanwhile the CAD software, specifically AutoCAD, specialized in technical drawing is also included as a tools to produce an accurate drawing. Student 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 / working drawing especially in 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 student in 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 system. Students will also be exposed on the requirements for installation, codes and standards used in technical services and installation system 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 lesson learnt will also be discussed in details. We aspect student will be able to understand an 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: Understand the scope of HSE in maintenance management and maintenance-related Process Safety Management (PSM)'s elements.
CO2: Evaluate HSE aspects in facilities maintenance
CO3: Explain the various features of HSE for maintenance management and related regulations.
CO4: Review and analyze the cause and effects of industrial incidents and propose for improvement on safety work procedures during maintenance

BVF1243
Equipment Basic Care
Credit: 4

Synopsis

This course provide student 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 expose student 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: Able to perform monitoring task based checklist
CO2: Able to perform minor maintenance and repairs in order to prevent unpredicted breakdowns
CO3: Able to predict failures and analyzed gathered data from the equipment

BVF2124
Field Instrument Devices & Control
Credit: 3

Synopsis

This course will give students knowledge and skills how to operate, calibrate, and maintain the working operation of field devices and instrumentation control of oil and gas industry covering temperature, pressure, and flowrate devices

Course Outcomes

CO1: To perform basic maintenance of the devices and instrumentation control
CO2: To understand the basic principles of field devices and instrumentation in oil and gas industry consisting of temperature, pressure and flowrate measurement devices
CO3: To select and operate the devices and instrumentation control for measurement and calibration

BVF2114
Equipment Maintenance Strategy
Credit: 3

Synopsis

The understanding of the strategy in conducting equipment maintenance in oil and gas need 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 process 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, student will also be exposed to the fundamental of Total Productive Maintenance (TPM) and an overview of risk-based inspection. The TPM will bring student to understand more about the concept for maintaining equipment while RBI is a systematic inspection methodology that will help student 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

Heavy material handling requiring the use of cranes or hoists is a potentially hazardous activity. To assure the safety of such operations, stringent controls for the use of such equipment, including below-the-hook components should be exercised, and the procurement, maintenance and inspection of all such equipment should be strictly controlled. This course is intended to provide student's the basic guidelines and apply safe practices & procedures to assure that all lifting and rigging operations are performed safely and in conformance with all applicable standards, as well as to minimize the risk of injury to personnel and damage to equipment and property.

BVF2133
Oil and Gas Project Management
Credit: 3

Synopsis

This subject will introduce the student the type of contract awarded to contractor in oil and gas industry. In this cases, contract awarded in the form of EPCC (engineering, procurement, construction and commissioning). Student 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

BVF1234
Welding and Inspection
Credit: 3

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 components safely.
CO4: Able to perform basic inspection of welding materials, identify defect and remove defect based on current standard practice

BVF3214
Plant Commissioning and Shutdown
Credit: 3

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 industrialist. It will cover subjects such as plant inspection, instrument testing, leak testing, pressure testing, plant monitoring, commissioning hazards, permit to work, 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
CO2 Apply the common engineering practices in each activity in the process and operation of plant commissioning, start-up 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 fundamental of asset integrity in oil and gas industry. Technologist 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

This course exposed the students to acquire skill and knowledge on various type of Pipe and Fitting, Valves and Safety Valves, Strainer, Steam Trap and P&ID through theory and practical sessions. Hands on practical on valves maintenance and inspection will be done according to correct and safe working procedures.

Course Outcomes

CO1: Explain the type, construction, function and operation of valves and safety valves, strainer & steam trap and understand P&ID

CO2: Perform gasket making and pipe installation, valves and safety valves, strainer and steam trap maintenance
CO3: Perform hydrostatic testing on piping system, housekeeping on tools, equipment and work area

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

BVF3134
Fired Vessel Operation & Maintenance Supervision
Credit: 4

Synopsis:

This course exposed the students to acquire skill and knowledge on various type of Pipe and Fitting, Valves and Safety Valves, Strainer, Steam Trap and P&ID through theory and practical sessions. Hands on practical on valves maintenance and inspection will be done according to correct and safe working procedures.

BVF3234
Unfired Pressure Vessel Operation, Maintenance & Troubleshooting
Credit: 4

Synopsis:

This course exposed the students to acquire skill and knowledge on various type of Pipe and Fitting, Valves and Safety Valves, Strainer, Steam Trap and P&ID through theory and practical sessions. Hands on practical on valves maintenance and inspection will be done according to correct and safe working procedures.

BVF3244
Piping and Flange Management
Credit: 4

Synopsis:

This course aims to provide technical knowledge and view to evaluate piping flange, fitting systems and services for oil and gas industry. These include oil and gas piping and flange fitting technical services, technical material, fabrication, installation, testing and commissioning. Students will also be exposed on the requirements for installation, codes and standards used in the technical services and installation of piping and flange fitting system of oil and gas. Other relevant topics such as welding, corrosion control, testing, housekeeping, work area and P&ID skills will also be introduced to the students.

BVF2214
Pump 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 pump. The topics cover 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 pump as well as able to operate and maintain the pump.

BVF2224
Compressor Operation and Maintenance Supervision
Credit: 4

Synopsis:

The fundamental aim of this course is to introduce one of the rotating equipment’s employed in the oil & gas industry which is compressor. The topics cover in this course are introduction to compressor, 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 compressor as well as able to operate and maintain the compressor.

BVF3114
Reciprocating Piston Engine Operation and Maintenance Supervision
Credit: 4

Synopsis:

The fundamental aim of this course is to introduce one of the rotating equipment's employed in the oil & gas industry which is reciprocating piston engine. The topics cover in this course are introduction to reciprocating piston engine, 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 reciprocating piston engine as well as able to operate and maintain this type of engine.

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 turbine. The students will be exposed to hands on practical training and developed them into skilled and expert technologist 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

BVF3204
Steam Turbine Operation and Maintenance Supervision
Credit: 4

Synopsis:

This course provides understanding of the concepts related to design, installation, operation and maintenance of steam turbine. The students will be exposed to hands on practical training and developed them into skilled and steam turbine specialization. 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

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 developed the monitoring 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

BVF3144
Storage Tank Operation & Maintenance
Credit: 4

Synopsis:

This course provides understanding of the storage tank types, function and design which are commonly found in the industry. Codes and standards involves in designing a tank is summarized and each of the components of tank is explained in details. Storage tank inspection and maintenance will go a long way in making a tank safer to store products for longer periods of time.

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UNIVERSITI MALAYSIA PAHANG

FACULTY OF CIVIL ENGINEERING TECHNOLOGY

UNDERGRADUATE PROSPECTUS 2021/2022

BACHELOR OF ENGINEERING TECHNOLOGY (INFRASTRUCTURE MANAGEMENT) WITH HONS.

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF ENGINEERING TECHNOLOGY (INFRASTRUCTURE MANAGEMENT) WITH HONS.

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**
COURSES	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 (18 weeks)
	UHC2022 Penghayatan Etika dan Peradaban	BET1303 Applied Physics	UHC1012 Falsafah dan Isu Semasa	UHS1022 Soft Skills	UHE3122 Islamic Institutions	BET4042 Entrepreneurship for Technologists	BET4774 Technology Design Project	
	UQ*10*1 Co-Curriculum 1	BET2343 Spatial Science Engineering	UQ*20*1 Co-Curriculum 2	BET1263 Geology and Geomechanics	BET4222 Technologist in Society and Law	BET3683 Final Year Project 1	BET4**3 Elective 1 (Forensic investigation in Infrastructure)	
	BUM1223 Calculus	BET1213 Engineering Practice 1	BUM2413 Applied Statistics	BET2344 Infrastructural Planning (Studio 4)	BET3634 Infrastructural Design (Studio 5)	BET3644 Infrastructural Management (Studio 6)	BET4**3 Elective 2 (Advance Material Testing Technology)	
	BET1114 Infrastructural Exploration (Studio 1)	BET2373 Construction Engineering	BET2413 Project Scheduling	BET2422 Financial Management for Decision Making	BET 3582 Digital Construction Technology	BET3593 Quality Performance Management	BET4**3 Elective 3 (Advanced Project Planning)	
	BET1123 Introduction to Infrastructural Engineering	BET1474 Infrastructure Investigation (Studio 2)	BET2334 Infrastructural Project (Studio 3)	BET1113 Green Technology for Infrastructure Facilities	BET3563 Building Facilities & Maintenance	BET1613 Engineering Practice 3	BET4**3 Elective 4 (Engineering Management)	
	BET1142 Introduction to Engineering Surveying		BET1252 Urban Infrastructure	BET1413 Engineering Practice 2	BET2492 Construction Safety	BET3513 Conflict and Risk Management		
	BET2483 Problem Solving and Analysis		BET2573 Construction Methods		BET3522 Procurement for Infrastructural Project			
TOTAL CREDIT	**18**	**18**	**20**	**19**	**18**	**19**	**16**	**12**
TOTAL CREDIT FOR GRADUATION	**140**							

The information provided by Faculty of Civil Engineering Technology are based on University's Regulation and endorsement until 12 March 2020

ELECTIVE COURSES FOR
BACHELOR OF ENGINEERING TECHNOLOGY (INFRASTRUCTURE MANAGEMENT) WITH HONS.

NO.	CODE	COURSE	CREDIT HOUR
1	BET4**3	Elective 1 (Forensic investigation in Infrastructure)	3
2	BET4**3	Elective 2 (Advance Material Testing Technology)	3
3	BET4**3	Elective 3 (Advanced Project Planning)	3
4	BET4**3	Elective 4 (Engineering Management)	3
TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION			**9**

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

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.

PROGRAMME OUTCOMES (PO)

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 HONS.

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

CO 1 Analyze and apply appropriate calculus concepts to solve various science and engineering problems.
CO 2 Use appropriate software and tool to solve the graphical and computational problems in calculus.
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.

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

CO 1 Analyse data using statistical theory and methodology, draw a conclusion and give a suggestion based on the data analysed.
CO 2 Perform statistical data analysis using available statistical packages including scientific calculator.
CO 3 Apply statistical concepts and methods to solve related problems in various disciplines.
CO 4 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

CO 1 Identify and describe the definition and the principle of green technology in construction especially for infrastructural facilities.
CO 2 Describe the engineering problems and solve the problem by applying the element of green technology.
CO 3 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

CO 1 Apply basic Physics concepts and theories learned to solve problems covered in the syllabus in terms of physical principles and concepts.
CO 2 Explain solution of any related problems using the right principles and laws.
CO 3 Study and 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

CO 1 Identify different types of drawings and reproduce drawings manually and by using AutoCAD.
CO 2 Apply basic skills in mathematics, sciences and engineering drawing including 2D solid modelling using CAD.
CO 3 Examine the process involved in infrastructure design projects
CO 4 Collaborate on team based projects, solve inter team problems and develop communications skills.

BET1123
Introduction to Infrastructure 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

CO 1 Using available examples, sketches, phrases and pictures to demonstrate understanding about civil engineering.
CO2 Applying planning principles to generate ideas for civil engineering projects
CO3 Executing conceptual design for structural and infrastructural projects.
CO4 Choosing suitable IT tools as to aid design and documented project output.

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

CO 1 Identify and describe the definition and the principle of engineering survey including the engineering surveying roles in infrastructural works.
CO2 Describe the procedure to perform horizontal and vertical control based on related

provision.
CO3 Understand the range of calculations that can be made with surveying data.

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. 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 instrumentation and measurement, as well as the application of different lab equipment related to civil infrastructure. In addition, students will be introduced to the library and computing facilities of the University and are expected to utilize these resources in the compilation of their reports. All students will be introduced to the Workplace Health and Safety Act and will undertake a preliminary workplace health and safety exercise.

Course Outcome

CO 1 Demonstrate practical skills in handling civil infrastructure lab equipment.
CO2 Apply basic health and safety principles in workplace setting.
CO3 Preparing technical reports that demonstrates use of library and computing facilities.
CO4 Contribute as part of a team to complete a specific task in a specific time.
CO5 Communicate the material/tasks assigned effectively to public (oral and written).

BET2343
Spatial Science Engineering
Credit: 3
Prerequisites: BET1142
Synopsis

The course covers on introduction to spatial sceience engineering, google map as free online GIS, spatial investigation using GIS, mygis (Malaysia GIS) portal and arcgis online application.

Course Outcome

CO 1 Using available examples, sketches, phrases and pictures to demonstrate understanding about spatial science engineering.
CO2 Exploring the application of google map for spatial science engineering tasks.
CO3 Reviewing the application of local GIS for spatial science investigation.
CO4 Choosing suitable IT tools as sustainable tool for conducting spatial science engineering.

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

CO 1 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 organizations. Students will discover a number of sophisticated tools and technique that can be applied in managing time and costs effectively on every type of project. Selected project management tools/software will be introduced 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

CO 1 Understand the importance of scheduling and estimation in ensuring a successful infrastructure project.
CO2 Understand the concepts of project planning and organization, budgeting and control, and project life cycles.
CO3 Apply Precedence Diagram Method (PDM) in determining relationship between tasks
CO4 Use appropriate techniques for resource estimation for infrastructure project planning.
CO5 Demonstrate the ability of using Project Management software in managing a project.

BET2334
Infrastructural Project (Studio 3)
Credit: 4
Prerequisites: BUM1223 & BET1474

Synopsis

The course is the continuation of Infrastructural Project (Studio 2) in which students conduct infrastructural design, project BQ and cost estimation, project report and engineering drawing for a selected study area 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

CO 1 Communicate efectively 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.

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 Recognize the principles of implementing infrastructure in urban areas.
CO2 Determine solutions in tackling issues regarding 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 contruction 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

CO 1 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 analyze data, propose solutions, solve problems and to evaluate possible solutions. In addition the student is required to further develop their computer skills (especially Excel) to analyze statistics, illustrate and present the results of their work.

Course Outcome

CO 1 Work as part of a multi-disciplinary and multi-cultural team to analyze, research, synthesize and evaluate solutions for defined engineering and surveying problems and systems.
CO2 Contribute as part of a team working on defined engineering and surveying problems to develop engineering design solutions, value the views of other members and facilitate decision making in team situations to solve an engineering problem or complete a project.
CO3 Undertake a program of self-directed independent learning to acquire the necessary learning within an allocated sub-discipline area to contribute to the team's solution of the set problem and should be communicated to other team members by means of mentoring during regular team meetings.
CO4 Demonstrate the ability to apply appropriate Engineering, Mathematical and Statistical principles and techniques on an individual basis; to explain phenomena encountered in the set range of problems, utilizing the knowledge base gained from individual self-learning journey.
CO5 Communicate findings in an appropriate technical format.

BET1263
Geology and Geomechanics
Credit: 3
Prerequisites: None

Synopsis

This course provides an elementary introduction and the basic mechanics necessary for Geology and Geomechanics. The course aims to provide understanding the strength of rock and soil, exploring the stability of slopes, type of suitable shallow foundation and compressibility of soil. Those understanding from the nature of rock and soils as engineering materials that applies to engineering Practice.

Course Outcome

CO 1 Apply the knowledge of rock and soil characteristics in for geomechanic analysis and soil stabilization.
CO2 Acknowledge the geological background and the formation of soil.
CO3 Produce related diagram for slope stability analysis by using various methods.
CO4 Able to determine the principle of settlement under structures.
CO5 Apply the strength parameters appropriate to a range of stability problems, and able to differentiate between total and effective stress approaches.

BET2344
Infrastructure Planning (Studio 4)
Credit: 4
Prerequisites: BET2413 & BET2334

Synopsis

This course attempts to explain the fundamental aspects of management and planning skills necessary to plan and maintain infrastructure. Major aspects that are covered throughout the course includes major infrastructure in context, master planning, infrastructure project performance, prioritization of projects and services, environmental and social impacts as well as uncertainty and risks. Case studies and hands-on projects are introduced to students to further enhanced their knowledge in planning and managing infrastructure projects.

Course Outcome

CO 1 Understand the steps in planning infrastructure projects.
CO2 Understand the needs of environmental, social, legal and institutional aspects in infrastructure planning.
CO3 Differentiate different types of privitization elements and professional construction services in infrastructure projects.
CO4 Apply the concept of infrastructure planning in project-based cases and scenarios
CO5 Demonstrate the ability of using Project Management software in managing a project.

BET2422
Financial Management for Decision Making
Credit: 2
Prerequisites: None

Synopsis

The application of financial management for decision making for project evaluation. Coverage includes decisions on cost estimate, revenue generation and feasibility study.
Course Outcome

CO 1 Apply basic economic analysis in estimating cost estimate.
CO2 Analyse revenue generation of project based on market study.
CO3 Evaluate project feasibility and viability.
CO4 Produce a a sustainable procedure for making decision.

BET2373
Construction Engineering
Credit: 3
Prerequisites: None

Synopsis

The construction sector is a major part of the civil infrastructure and building industries. Construction projects range in size from the small (such as the construction of a swimming pool or a subdivision) to the very large (such as the construction of a hydroelectric power scheme or a freeway). However, all projects share the common factors of utilizing workers, machines and materials, and of requiring organization and control. The graduate must, therefore, be familiar with the range of construction equipment and techniques in common use, and must be able to plan and direct construction works. The course covers the areas of construction techniques, construction management and concrete technology.

Course Outcome

CO 1 Examine the basic characteristics and use of equipment commonly used in civil infrastructure and building construction.
CO2 Examine commonly used construction techniques of the engineering construction industry.
CO3 Analyse and apply commonly used planning and control techniques used in civil infrastructure and building construction.
CO4 Evaluate the properties of, and analyse the interaction between, the principal component materials used in the production of concrete.
CO5 Formulate concrete mix design and plans quality control procedures for production and placement of concrete.

BET1413
Engineering Practice 2
Credit:3
Prerequisites: None

Synopsis

This course includes practice modules covering aspects of Geology and Geomechanics. Practice requirements for each module include laboratory work in a team environment, field excursions and the preparation of individual reports on these practice activities. The qeological field excursion provides the student with in-situ activity. Identification the significant of engineering properties on soil and rock was main focus in this course. Students will be required to carry out soil tests according to Malaysian Standards to gauge various engineering properties in geomechanics.

Course Outcome

CO 1 Identify the civil engineering significance of common geological structures and discuss the implication of weathering and landform development.
CO2 Identify a range of minerals and rocks and applying their properties to resolve civil engineering examples and problems.
CO3 Measure basic civil engineering properties of soils using standard testing procedures.
CO4 Analyse and present experimental data to a suitable engineering standard.
CO5 Understand and analyse the concept of permeability, flow nets, consolidation of soil and settlement of structure.

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

The course is designed to provide students with knowledge in building facilities and maintenance in practice and their responsibilities towards the profession and the society. The course highlights the application of science and technology, issues of the impact of building facilities technology on development and environment, issues of technologist in the Malaysian context. Upon the completion of the course, students will have demonstrated an ability to apply the basic physical and engineering sciences and technology underlying the building facilities and building maintenance services systems in different kinds of applications. They will possess an understanding of the major building services systems and their integration into the architecture and structures.

Course Outcome

CO 1: An understanding of the facilities and building maintenance and their integration and coordination into the architecture and structures.
CO2: To apply the BFM concepts underlying the functions of facilities and building maintenance.
CO3: To analyse a building facilities or a selected system component of a specific building service system in a building according to and complying with the engineering policies, regulations, guidelines, manuals, standards and specifications.

BET4222
Technologist in Society and Law
Credit: 2
Prerequisites: None
Synopsis

This course combines Seminar and Introduction to Law courses in an integrated course that will be delivered by experienced faculty members and guest lecturers. It will cover topics such as ET career, ET code of ethics, accreditation of ET programmes, ET professional bodies, route to professional technologist, industry expectation of the ET graduates, women in ET, globalization of the ET profession, future roles and challenges of ET in society.

Course Outcome

CO 1 Be aware about career development in ET and care for the code of ethics.
CO2 Be acknowledged about the required training and registration by be able to identify the relevant professional bodies and illustrate path of the route to Professional.
CO3 Comply to industry expectation by be able to describe opportunities and challenges and show concern of the globalization of ET profession.
CO4 Show continual desire or concern of future roles and challenges of ET by demonstrating and explain issues and give example of modern tools in ET practices.

BET2573
Construction Methods
Credit: 3
Prerequisites: BET2373

Synopsis

This course covers the preliminary works and site establishment activities associated with commencing a construction job. It also deals with foundations and soil stabilization techniques, the production and use of common construction materials and discusses some elements associated with the construction of major infrastructure facilities.

Course Outcome

CO 1 Determine the infrastructure requirements for a construction job and apply a knowledge of the job establishment process.
CO2 Explain and apply the basic methods of foundation construction and soil stabilization.
CO3 Differentiate the main elements involved in timber, steel and concrete structures.
CO4 Select and justify appropriate protective treatments for different structures and explain the various treatment processes involved.
CO5 Evaluate and differentiate between the commonly used methods and techniques for the construction of selected major infrastructure facilities.

BET4042
Enterpreneurship for Technologists
Credit: 2
Prerequisites: None

Synopsis

This subject is designed to provide students with the knowledge, skills, and abilities necessary to plan, finance, develop and operate a new business venture. Through the analysis of case studies on entrepreneurial ventures and writing their own business plan screening guide, students learn how to assess the attributes of entrepreneurs, determine the attractiveness of new venture opportunities, and gather the resources necessary to convert a viable opportunity into an entrepreneurial venture.

Course Outcome

CO 1 Explain the concept of entrepreneurship, its historical development and the role of entrepreneurship in economic development.
CO 2 Analyse a new or growing venture from the perspective of an investor, a family-business successor, or an owner-manager.
CO 3 Produce and present a business plan for a new or growing venture.
CO4 Identify the important issues related to legal aspects of entrepreneurship.

BET3634
Infrastructural Design (Studio 5)
Credit: 4
Prerequisites: BET1303 & BET2344

Synopsis

This course attempts to explain the fundamental aspects of design skills necessary to construct the infrastructure. Major aspects that are covered throughout the course includes design one or two major infrastructure in context,preliminary design, project report and engineering drawing, environmental and social impacts as well as uncertainty and risks. Case studies and hands-on projects are introduced to students to further enhanced their knowledge in designing and constructing infrastructure projects.

Course Outcome

CO 1 Understand the steps in desingning infrastructure projects.
CO2 Understand the needs of environmental, social, legal and institutional aspects in infrastructure designing.
CO3 Differentiate different types of infrasturucture and typical design in infrastructure projects.
CO4 Apply the design of infrastructure in project-based cases and scenarios.
CO5 Demonstrate the ability of using computer program software in designing a project.

BET3683
Final Year Project 1
Credit: 3
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

CO 1 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

CO 1 Communicate efectively 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

CO 1 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

CO 1 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

This course is designated to expose to students various managerial skills and good practices in managing conflict infrastructure projects. Students are also introduced to the risk management aspect in a project.

Course Outcome

CO 1 Identify good practices in managing conflicts among team members.
CO2 Describe steps in effective risk management in infrastructure projects.
CO3 Understand risks associated with infrastructure project lifecycle.
CO4 Apply concepts of effective risk management through case studies.

BET3522
Procurement for Infrastructural Project
Credit: 2
Prerequisites: None

Synopsis

Front end engineering design, detailed engineering, asset improvement, procurement and construction management, EPCM and PMC services for customer sector based on HVE (High Value Engineering) and low-cost but high quality professional services that meet international standards.

Course Outcome

CO 1 Differentiate between procurement and value added.
CO2 Propose procedure on how to conduct design review.
CO3 Organise value management value.
CO4 Conclude procuurement as a binding report.

BET4783
Final Year Project 2
Credit: 3
Prerequisites: BET3683

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 Analyze data, discuss and conclude the findings.

CO2 Manage the research work.
CO3 Practice positive attitude and ethics in research activities.
CO4 Present the research report and cited latest publications on the subject.

BET4774
Technology Design Project
Credit: 4
Prerequisites: BET3644

Synopsis

In this course, the widest implications of a service, product or process are considered at the project design stage, including not only the technical interactions of the various sub-systems, but also the financial ethical, sociological, and socio-economic implications. This course leads the students the understanding of the philosophy and methodology of the design process in the context of the system which embraced sociological, economic, technical and ergonomic aspects. The technology design project is the capstone project course in the four year bachelor of engineering technology (infrastructure management).

Course Outcome

CO 1 Conceptualize problems and develop strategic solutions from open-ended scenarios.
CO2 Identify, review, and evaluate multi-disciplinary design projects that require the system design approach.
CO3 Rationalize, plan, develop, optimize, and communicate a system design in the wider engineering environment of statutes, ecology, common law, ergonomics, social acceptability, marketing, and economics, etc.
CO4 Transfer and apply appropriate use of computer technology to the design project.
CO5 Cooperate as effective members of teams working and communicate the multi-displinary project results in a professional manner with formal report structure, an executive summary and a formal conveyance letter.

BACHELOR OF ENGINEERING TECHNOLOGY (ENERGY & ENVIRONMENTAL) WITH HONS.

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CURRICULUM STRUCTURE

BACHELOR OF ENGINEERING TECHNOLOGY (ENERGY & ENVIRONMENTAL) WITH HONS.

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	**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							
TOTAL CREDIT PER SEMESTER	**20**	**19**	**20**	**20**	**18**	**18**	**15**	**12**
TOTAL CREDIT FOR GRADUATION	**142**							

The information provided by Faculty of Civil Engineering Technology are based on University's Regulation and endorsement until 12 March 2020

ELECTIVE COURSES FOR
BACHELOR OF ENGINEERING TECHNOLOGY (ENERGY AND ENVIRONMENTAL) WITH HONS.

NO.	CODE	COURSE	CREDIT HOUR
1	BTV4703	Solar energy system	3
2	BTV4753	Environmental impact assessment	3
3	BTV4763	Geographic information system	3
Total minimum credits of elective courses for graduation			**9**

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

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.

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 in energy and environment area.

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 HONS.

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

Synopsis

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 envelops, 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 identity 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.

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UNIVERSITI MALAYSIA PAHANG

FACULTY OF COMPUTING

UNDERGRADUATE PROSPECTUS 2021/2022

BACHELOR OF COMPUTER SCIENCE (SOFTWARE ENGINEERING) WITH HONOURS

BACHELOR OF COMPUTER SCIENCE (COMPUTER SYSTEMS & NETWORKING) WITH HONOURS

BACHELOR OF COMPUTER SCIENCE (GRAPHICS & MULTIMEDIA TECHNOLOGY) WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF COMPUTER SCIENCE (COMPUTER SYSTEMS & NETWORKING) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEM	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**
COURSES	BCN1043 Computer Arhitecture And Organization	BCI1023 Programming Techniques	BCI2023 Database Systems	BCI2313 Algorithm & Complexity	BUM2413 Applied Statistics	BCS2313 Artificial Intelligence Techniques	BCN3063 Distributed & Parallel Computing	BCC4012 Industrial Training
	BCI1143 Problem Solving	BCN2053 Operating Systems	BUM1433 Discrete Structure & Application	BCS1133 Systems Analysis and Design	BCS2143 Object Oriented Programming	BCN2023 Data & Network Security	BCC3024 Undergraduate Project II	
	BUM1233 Discrete Mathematics & Application	BCN1053 Data Communication and Networking	BCI1093 Data Structure & Algorithms	BCN3033 Network Programming	BCN3043 Network Service Administration	BCS2243 Web Engineering	BCN1*23 Elective BCN II	
	BCN1063 Structured Network Cabling	BCS1033 Software Engineering	BCN2193 Network Technologies	BCN2083 Computer Networks	BCN2093 Network Analysis and Design	BCC3012 Undergraduate Project I	BCN1*33 Elective BCN III	
	UQB1**1 Co-Curriculum 1	UHC2022 Penghayatan Etika Dan Peradaban	UHF1**1 Foreign Language Level I	UHE3**2 Elective Course	BCN3203 Wan Technology	BCN3023 Network Management	UHF2**1 Foreign Language Level II	
	UHC1012 Falsafah Dan Isu Semasa	UHL2412 English For Academic Communication	UHL2422 English For Technical Communication	UGE2002 Technopreneurship	UHL2432 English For Profesional Communication	BCN1*13 Elective BCN I	UHE***2 Elective Courses	
	UHS1021 Soft Skills 1	UHL2400 Fundamentals of English Language				UHS2021 Soft Skills 2		
	UCS1110 First Year Seminar	UQ*2**1 Co-Curriculum II						
TOTAL CREDIT	**16**	**17**	**15**	**16**	**17**	**18**	**16**	**12**
TOTAL CREDIT FOR GRADUATION	**127**							

BACHELOR OF COMPUTER SCIENCE (SOFTWARE ENGINEERING) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEM	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**
COURSES	BCI1143 Problem Solving	BCI2023 Database Systems	BCI1093 Data Structure & Algorithms	BCN2053 Operating Systems	BCI2313 Algorithm & Complexity	BCS1*23 Elective BCS II	BCS1*23 Elective BCS III	BCC4012 Industrial Training
	BCS1033 Software Engineering	BCN1053 Data Communication And Networking	BCS2143 Object Oriented Programming	BCS2313 Artificial Intelligence Techniques	BCS2213 Formal Method	BCC3012 Undergraduate Project I	BCC3024 Undergraduate Project II	
	BCN1043 Computer Arhitecture And Organization	BCI1023 Programming Techniques	BCS2173 Human Computer Interaction	BCS2243 Web Engineering	BCS3233 Software Testing	BCS3133 Software Engineering Practices	BCS3263 Software Quality Assurance	
	BUM1233 Discrete Mathematics & Application	BCS1133 Systems Analysis And Design	BCS2233 Software Requirement Workshop	BCS2343 Software Design Workshop	BCN2023 Data & Network Security	BCS3153 Software Evolution & Maintenance	UHF2**1 Foreign Language Level II	
	UQB1**1 Co-Curriculum 1	BUM1433 Discrete Structure & Application	UQ*2**1 Co-Curriculum II	BUM2413 Applied Statistics	UHL2432 English For Professional Communication	BCS3143 Software Project Management	UHE***2 Elective Course	
	UHS1021 Soft Skills 1	UHL2412 English For Academic Communication	UHL2422 English For Technical Communication	UGE2002 Technopreneurship	BCS1*13 Elective BCS I	UHE3**2 Elective University I		
	UHC1012 Falsafah Dan Isu Semasa	UHL2400 Fundamental Of English Language	UHC2022 Penghayatan Etika Dan Peradabav			UHS2021 Soft Skills 2		
	UCS1110 First Year Seminar					UHF1**1 Foreign Language Level I		
TOTAL CREDIT	**16**	**17**	**17**	**17**	**17**	**18**	**13**	**12**
TOTAL CREDIT FOR GRADUATION	**127**							

BACHELOR OF COMPUTER SCIENCE (GRAPHICS & MULTIMEDIA TECHNOLOGY) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
COURSES	BCI1143 Problem Solving	BCN1053 Data Communication & Networking	BCI1093 Data Structure & Algorithms	BCG1*13 Elective BCG I	BCS2243 Web Engineering	BCI2313 Algorithm & Complexity	BCG1*33 Elective BCG III	BCC4012 Industrial Training
	BCS1033 Software Engineering	BUM1133 Mathematics for Computer Graphics	BCS1133 System Analysis & Design	BCN2053 Operating Systems	BCS2313 Artificial Intelligence Techniques	BCN2023 Data & Network Security	BCG1*23 Elective BCG II	
	BCN1043 Computer Arhitecture And Organization	BCI2023 Database Systems	BUM1433 Discrete Structure & Application	BCS2143 Object Oriented Programming	BCM3163 Computer Game Programming 1	BCM3203 Computer Game Programming II	BCC3024 Undergraduate Project II	
	BUM1233 Discrete Mathematics & Application	BCI1023 Programming Techniques	BCM2053 Computer Graphic	BCS2173 Human Computer Interaction	BCI3283 Mobile Application Development	BCC3012 Undergraduate Project I	UHE***2 Elective Course	
	BCM2023 Fundamental of Digital Media Design	UQ*2**1 Co-Curriculum II	UHF1**1 Foreign Language Level I	BCM3233 3d Modeling & Animation	BCM3103 Virtual Reality	BCM3243 Multimedia Development Workshop	UGE2002 Technopreneurship	
	UQB1**1 Co-Curriculum 1	UHC1012 Falsafah Dan Isu Semasa	UHC2022 Penghayatan Etika Dan Peradaban	UH3***2 Elective Course	UHS2021 Soft Skills 2	UHL2432 English For Professional Communication		
	UHS1021 Soft Skills 1	UHL2400 Fundamental of English Language	UHL2422 English For Technical Communication	UHF2**1 Foreign Language Level II				
		UHL2412 English For Academic Communication						
TOTAL CREDIT	**17**	**17**	**17**	**18**	**16**	**16**	**14**	**12**
TOTAL CREDIT FOR GRADUATION	**127**							

ELECTIVE COURSES TO BE OFFERED

NO.	CODE	COURSE	CREDIT HOUR
1	BCN3213	EMBEDDED SYSTEM	3
2	BCN3233	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	3
9	BCM3253	DATA ANALYTIC AND VISUALIZATION	3
10	BCM3263	AUGMENTED REALITY	3
11	BCI3283	MOBILE APPLICATION DEVELOPMENT	3
12	BCI3293	EMERGING TECHNOLOGY	3

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1	Competent	

PEO1 Competent

Competent ICT professionals, adopt an attitude of professionalism and contribute to the development of the digitization agenda in the organization, entrepreneurship or community across a variety of different fields.

PEO2 Adaptability

ICT professionals who have the ability to enhance competencies, leadership and personal development for career advancement and in turn contribute to the development of the country.

PEO3 Leadership

ICT professionals who show commitment to their careers as well as the community, hold responsibilities that can contribute to the perfection of society.

PROGRAMME OUTCOMES (PO)

PO1	Demonstrate knowledge and understanding of the theory and principles of Computer Science specialising in Cyber Security/Software Engineering/Computer Systems & Networking/Multimedia Software/Computer Science (Knowledge and Understanding)
PO2	Demonstrate knowledge and understanding of the theory and principles of Computer Science specialising in Cyber Security/Software Engineering/Computer Systems & Networking/Multimedia Software/Computer Science (Cognitive Skills)
PO3	Apply appropriate techniques, skills and tools in computer science practices specialising in Cyber Security/Software Engineering/Computer Systems & Networking/Multimedia Software/Computer Science to understanding the body of knowledge and/or solve a problem. (Practical Skills)
PO4	Demonstrate the ability to possess relationships and collaborative skills in managing relationships in teams and within the organisations (Interpersonal Skills)
PO5	Communicate clearly and effectively to convey ideas in written and oral form, confidently, accurately and coherently using appropriate context and language. (Communication Skills)
PO6	Choose/use appropriate technology to support/solve the problem at hands (Digital Skills)
PO7	Apply mathematical and other quantitative, qualitative tools to analyze and evaluate numerical & graphical / visual data for solving problem in the real context. (Numerical Skills)
PO8	Demonstrate autonomous leadership skill to the assigned responsibilities in a team. (Leadership, Autonomy and Responsibility)
PO9	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)
PO10	Demonstrate entrepreneurial thinking and innovational thinking within the field of computer science (Entrepreneurship Skills)
PO11	Demonstrate ethical behaviour and act professionally within the varied environment and practice. (Ethics and Professionalism)

COURSE SYNOPSIS

COURSE SYNOPSIS – DEGREE

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 and the representation of data, the internal and external computer communication through system buses and Input and 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 component as a whole.

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. Explain how the components of a computer architecture and organization contribute to the computer performance.
CO2: Display and calculate the different machine data level representation, arithmetic and write a assembly language code to show computer inner working behavior.
CO3: Demonstrate team working element by solving problems of computer architecture and organization in a groups.

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

BCN1063
STRUCTURE NETWORK CABLING
Credit Hour: 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: Investigate the Local Area Network elements such as basic of networking, safety environment, network hardware and related LAN.
CO2: Design, install, implement, configure, test and troubleshoot structured cabling and LAN device based on LAN rules and standard.
CO3: Identify problem, discuss and make suggestion on the structured cabling network.

BCI1023
PROGRAMMING TECHNIQUES
Credit Hour: 3
Prerequisite: BCI1143 PROBLEM SOLVING

Synopsis:

This course discusses on understanding problems and translating them into computer solution techniques using programming language. This course enables students to select appropriate 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.

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: Distinguish the relationship between OS and hardware (User command interface, Memory Management, Processor Management, Concurrent Manager, File Management, Device Management & Network Management).
CO2: Construct & manipulate OS instructions via Command line and Shell Scripting.
CO3: Search and manage relevant information from different sources related to the operating systems.

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 knowledge and understanding of basics computer networking.
CO2: Construct a simple LAN topologies by applying basic principles of cabling using network simulation.
CO3: Follow basic configuration of network design using real network devices such as switches and routers.
CO4: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice in the context of data communication and networking.

BCS1033
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.

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 process.
CO2: Show technical solutions to a range of audience.
CO3: Work effectively in group and promote leadership's skills through effective communication ether in written, oral form, presentation and group discussion.

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. 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.

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.

BCI1093
DATA STRUCTURE &ALGORITHMS
Credit Hour: 3
Prerequisite: BCI1023 PROGRAMMING TECHNIQUES

Synopsis:

This course is designed to expose the students to the data structures and algorithm. It provide 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: Analise 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.

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, single-area and multi-area OSPF, virtual LANs, and inter-VLAN routing in both IPv4 and IPv6 networks.

Course Outcome:

By the end of semester, students should be able to:
CO1: Discover the critical role routers play in enabling communications across multiple networks.
CO2: Construct and organize basic operations for a newly-installed router with primary routing protocols.
CO3: Organize new idea and able for autonomous learning in the context of dynamic routing protocols and modern network design.
CO4: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice by identifying router, show and debug commands to troubleshoot common errors that occur in small routed networks.

BCI2313
ALGORITHMS AND COMPLEXITY
Credit Hour: 3
Prerequisite: BCI1093 DATA STRUCTURE & ALGORITHMS

Synopsis:

Algorithm design and analysis is a fundamental and important part of computer science. This course introduces students to advanced techniques for the design and analysis of algorithms and

explorers a variety of applications.
Course Outcome:
By the end of semester, students should be able to:
CO1: Analyze various advanced types of algorithms techniques in solving a related problem.
CO2: Construct a programme by applying the most optimize algorithms techniques for a related problem.
CO3: Use online application to find solution for a related problem.

BCS1133
SYSTEM ANALYSIS & DESIGN
Credit Hour: 3
Prerequisite: None

Synopsis:

This course describes 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 technique involved in analysis, design and implementation of information system.

Course Outcome:

By the end of semester, students should be able to:
CO1: Classify and choose the knowledge of systems analysis and design by selecting appropriate software development process and tools to be used.
CO2: Reproduce a system design from a case study that comply with the stages of systems development life cycle.
CO3: Work effectively in group and promote leadership's skills through effective communication ether in written, oral form, presentation and group discussion.

BCN3033
NETWORK PROGRAMMING
Credit Hour: 3
Prerequisite: BCI1023 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 the programming language and technique in relation to the networking concept.
CO2: Write, construct and runs the network programming.
CO3: Organize new idea and able to autonomous learning.

BCN2083
COMPUTER NETWORKS
Credit Hour: 3
Prerequisite: BCN2193 NETWORK TECHNOLOGIES

Synopsis:

The primary focus of this course is on LAN redundancy, wireless LANs 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.
Each concept will be introduced within the context of a single topology for each chapter.

Course Outcome:

By the end of semester, students should be able to:
CO1: Analyze of how a switch communicates with other switches and routers in a small or medium-sized business network to implement wireless LANs and routing protocol.
CO2: Organize the configuration, verification, and troubleshooting Wireless LANs, Single-area and Multi-area OSPF, and EIGRP.
CO3: Organize new idea and able for autonomous learning in the context of network problems at layers 1, 2, 3 and 7 using a layered model approach

BCS2143 OBJECT ORIENTED PROGRAMMING
Credit Hour: 3
Prerequisite: BCI1023 Programming Techniques

Synopsis:

This course provides an introduction to the concepts of object orientation and object-oriented programming (OOP) techniques using any object-oriented programming language such as JAVA. It will emphasize on the use of OOP characteristic that expose students to Unified Modelling Language (UML) design, class and object, inheritance, polymorphism, exception handling and Graphical User Interface (GUI) and event driven programming.

Course Outcome:

By the end of semester, students should be able to:
CO1: Demonstrate the ability of proposing solution based on object-oriented approach to the given problem.
CO2: Able to translate or implement from OOAD to working application/system.
CO3: Explain, explore and manipulate the proposes solution to build the application.

BCN3043
NETWORK SERVICE ADMINISTRATION
Credit Hour: 3
Prerequisite: None

Synopsis:

This course is designated to expose the student about Active Directory Technology Specialists including how to implement and configure secure network access and implement fault tolerant storage technologies, 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: Classify the services supported by the Server Technology.
CO2: Fix the problems to install and configure servers and clients applications individually.
CO3: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice in the Server Technology.

BCN2093
NETWORK ANALYSIS & DESIGN
Credit Hour: 3
Prerequisite: BCN1053 DATA COMMUNICATION & NETWORKING

Synopsis:

This course focuses on analysis and design of enterprise networks that are reliable, secure and manageable. It includes top-down network design methodology to design networks that meet customer’s business and technical goals, analyzation of business and technical requirements, examine traffic flow and Quality of Service (QoS) requirements, and production of RFP documentation with relevant procedure steps for case study/project to fulfil this subject requirement.

Course Outcome:

By the end of semester, students should be able to:
CO1: Analyze various computer networks, formulate problems and provide technical solutions to improve quality of service (QoS).
CO2: Build a logical and/or physical network following all the steps and documentation phases for a specific requirement.
CO3: Demonstrate ability to lead a project in order to produce RFP.

BCN3203
WAN TECHNOLOGY
Credit Hour: 3
Prerequisite: BCN2083 COMPUTER NETWORKS

Synopsis:

This course discusses the WAN technologies and network services required by converged applications in a complex network. The course enables students to understand the selection criteria of network devices and WAN technologies to meet network requirements. Students learn how to configure and troubleshoot network devices and resolve common issues with data link protocols. Students also develop the knowledge and skills needed to implement IPSec and virtual private network (VPN) operations in a complex network.
Course Outcome:

By the end of semester, students should be able to:
CO1: Analyze and classify the components required for switched network, switching concept involving configuration, VLAN, LAN redundancy, link aggregation, and inter VLAN routing. DHCP concept and configuration for IPv4 & IPv6, wireless LAN concept, configuration and security.
CO2: Assemble, build, construct and organize switched network involving basic switch configuration and security management, VLAN implementation, LAN redundancy via PSVT and link aggregation, inter - VLAN routing and troubleshooting, DHCP and wireless LAN setup.
CO3: Organize new idea and able for autonomous learning.

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 artificial intelligence concepts and methodologies in computer science.
CO2: Construct an intelligence system prototype/module.
CO3: Demonstrate critical thinking ideas in artificial intelligence knowledge and problem-solving.
CO4: Initiate AI knowledge to the final year/capstone projects and future problems.

BCN2023
DATA & NETWORK SECURITY
Credit Hour: 3
Prerequisite: BCN1053 DATA COMMUNICATION & NETWORKING

Synopsis:

The course introduces fundamental of data and network security. Course's chapters explain information security concepts, fundamentals, purposes, implementation and discussion in their respective areas related to data and network security. Topics include: foundational concepts in security, principles of secure design, threats and attacks, malware, cryptographic tools, network securing, and intrusion detection and prevention systems.

Course Outcome:

By the end of semester, students should be able to:
CO1: Analyze theory and principles of information security, types of security threats, potential attacks, data cryptography, firewalls, and intrusion detection systems.
CO2: Construct attack and defense methods into computer and network environments.
CO3: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice in the context of data network and security.

BCS2243
WEB ENGINEERING
Credit Hour: 3
Prerequisite: BCI1023 PROGRAMMING TECHNIQUES

Synopsis:

This course introduces the essential topics of managing the diversity and complexity of web applications development. Students are required to develop a web/Internet application based on web engineering concepts.

Course Outcome:

By the end of semester, students should be able to:
CO1: Design appropriate solution using fundamental web engineering concepts.
CO2: Construct a web-based application using web-engineering technologies.
CO3: Demonstrate communication effectively in written and oral form through group discussion, meeting and presentation session.

BCN3023

NETWORK MANAGEMENT
Credit Hour: 3
Prerequisite: None

Synopsis:

This course introduces the overview of network management to familiarize student with 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 particular networking environment. Student also equipped with the example of simple, complex and advanced tools for each category of network management so that they could determine that a particular functionality would be useful and might want to pursue its development.

Course Outcome:

By the end of semester, students should be able to:
CO1: Analyze all of the possible pieces of information available on a network device including Management Information Bases (MIBs) and also about Remote Network Monitoring Devices (RMON) MIB.
CO2: Organize Network Management Protocols such as Simple Network Management Protocol (SNMP) that is the most widely deployed network management protocols on networking devices.
CO3: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice by Identifying and explain the five areas of network management.

BCN3063
DISTRIBUTED & PARALLEL COMPUTING
Credit Hour: 3
Prerequisite: BCN1053 DATA COMMUNICATION & NETWORKING

Synopsis:

The course aims to provide an understanding of the principles on which the Internet and other distributed systems are based; their architecture, algorithms and how they meet the demands of contemporary distributed applications. The course covers the building blocks for a study of distributed systems, and addressing the characteristics and the challenges that must be addressed in their design: scalability, heterogeneity, security and failure handling being the most significant.

Course Outcome:

By the end of semester, students should be able to:
CO1: Demonstrate the principles and fundamentals of distributed and parallel computing the technical challenges and current issues the systems design.
CO2: Practice in analyzing, design and implementation of distributed and parallel programs to solve specified problems..
CO3 : Organize new idea and able for autonomous learning.

BCS2173
HUMAN COMPUTER INTERACTION
Credit Hour: 3
Prerequisite: BCS1033 SOFTWARE ENGINEERING

Synopsis:

This course provides an introduction to Human-Computer Interaction (HCI). HCI is concerned with understanding, designing, implementing and evaluating user-interfaces so that the students have better support users in carrying out their tasks. On completing this course, the students will have knowledge of the theoretical foundations of designing for interaction between humans and computers. They will also have practical experience in implementing and evaluating graphical user interfaces.

Course Outcome:

By the end of semester, students should be able to:
CO1: Analyze Human Computer Interface (HCI) principles and related approaches.
CO2: Construct an application based on HCI principles and approaches.
CO3: Work effectively in a team for a project on developing and evaluating the prototype based on HCI rules.

BCS2233
SOFTWARE REQUIREMENT WORKSHOP
Credit Hour: 3
Prerequisite: BCS1133 SYSTEMS ANALYSIS AND DESIGN

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 and writing Software Requirement Specifications (SRS) customize from DOD and IEEE standard.

Course Outcome:

By the end of semester, students should be able to:
CO1: Classify and capturing requirement by using appropriate software development process and tools to be used.
CO2: Construct a comprehensive Software Requirement Specification (SRS) document by using UML tools.
CO3: Fix problems and construct innovative solutions that comply with principles of software engineering (problem solving skills).
CO4: Work effectively in group and promote leadership's skills through effective communication ether in written, oral form, presentation and group discussion.

BCS2343
SOFTWARE DESIGN WORKSHOP
Credit Hour: 3
Prerequisite: BCS2233 SOFTWARE REQUIREMENT WORKSHOP

Synopsis:

This course introduces the students how to develop software development documents –Software Design Description (SDD) and their system development process. Continue from previous project/problems, students must produce Software Design Description document follow certain standards.

Course Outcome:

By the end of semester, students should be able to:
CO1: Analyze the software design and architecture then develop the software design documentation.
CO2: Construct a system prototype that comply with the pre-developed software design documentation.
CO3: Work effectively in group and promote leadership's skills through effective communication either in written, oral form, presentation and group discussion.

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.

Course Outcome:

By the end of semester, students should be able to:
CO1: Demonstrate the understanding of theory and principles of Formal Methods in software development.
CO2: Construct the software specification in formal notation using appropriate techniques, skills and tools.
CO3: Work and communicate effectively in group to develop software specification in formal notation.

BCS3233
SOFTWARE TESTING
Credit Hour: 3
Prerequisite: BCS1133 SYSTEMS ANALYSIS AND DESIGN

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: Compare and classify between various

levels of testing, test types and test approaches.
CO2: Organize and display the test activities throughout the software testing life cycle.
CO3: Work on the test design techniques, risk analysis and reporting within test process.

BCS3133
SOFTWARE ENGINEERING PRACTICES
Credit Hour: 3
Prerequisite: BCS2343 SOFTWARE DESIGN WORKSHOP

Synopsis:

The course aims to prepare software engineering students to work in a small team on a small project, and to gain hands on knowledge on software engineering practices through a capstone project.

Course Outcome:

By the end of semester, students should be able to:
CO1: Internalize the best practices for software engineering (from inception, design, implementation, testing, maintenance).
CO2: Formulate and justify software engineering solution for a particular problem.
CO3: Demonstrate critical thinking ideas to software design.

BCS3153
SOFTWARE EVOLUTION & MAINTENANCE
Credit Hour: 3
Prerequisite: BCS3233 SOFTWARE TESTING

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: Differentiate and classify the software evolution and m maintenance techniques and issues.
CO2: Examine technical and managerial problem in software maintenance.
CO3: Explain and organize the related information to justify the given idea.

BCS3143
SOFTWARE PROJECT MANAGEMENT
Credit Hour: 3
Prerequisite: BCS2343 SOFTWARE DESIGN WORKSHOP

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.

Course Outcome:

By the end of semester, students should be able to:
CO1: Distinguish appropriately the concepts and principles of Software Project Management.
CO2: Construct and produce a practical software project management plan based on PMBOK.
CO3: Utilise teamwork skill in executing the project plan.

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: Inquire a knowledge of main software quality assurance activities, their tasks, work

products and their models.
CO2: Organize software product quality related activities by applying ISO and IEEE standards.
CO3: Work in a team and present the team decision/solution for a given tasks.

BCM2023
FUNDAMENTAL OF DIGITAL MEDIA DESIGN
Credit Hour: 3
Prerequisite: None

Synopsis:

This course will provide students the foundations of media design using media software. Students will capture digital media and learn to manipulate them to create dynamic designs. Project-based curriculum will apply design elements and principles. This course will also expose students to the theoretical and fundamental concepts of multimedia, its applications and the techniques involved. Topics to be covered include five elements of multimedia such as text and audio, animation, image and video and the art of multimedia.

Course Outcome:

By the end of semester, students should be able to:
CO1: Demonstrate an understanding of terminology, software, principles and equipment necessary in digital media design.
CO2: Manipulate digital media design concepts in multimedia elements (text, graphic, audio, video & animation) using software tools and recognize the issues in context of digital media design in multimedia technology and able to adapt to other related fields
CO3: Work together effectively to achieve the same goal by building a good relationship and interaction among team members.

BCM2053
COMPUTER GRAPHICS
Credit Hour: 3
Prerequisite: BCI1023 PROGRAMMING TECHNIQUES

Synopsis:

This course is designed to expose the student to the concept of computer graphics. This includes understanding and designing aspects by using a computer graphics concepts and technology. Through this course, students will be exposed to the skill of interactive computer graphics and some drawing algorithms using a computer graphics.
Course Outcome:
By the end of semester, students should be able to:
CO1: Demonstrate the concept of computer graphics and ability to use the computer graphics technology.
CO2: Construct 2D graphics by implementing concepts of computer graphics and computer graphics programming.
CO3: Work together effectively to achieve the same goal by building a good relationship and interaction among team members.

BCM3233
3D MODELLING & ANIMATION
Credit Hour: 3
Prerequisite: None

Synopsis:

The focus of the course is on 3D modelling and animation. Students are introduced to 3D modelling and animation methods such as modelling with NURBS, polygons, and subdivision surfaces. Texture mapping, lighting, key framing, rigging and rendering are also discussed. Production pipeline issues such as geometry deformation and level of detail are emphasized.

Course Outcome:

By the end of semester, students should be able to:
CO1: Demonstrate understanding of 3D modelling basic concepts and its methods.
CO2: Construct 3D models by implementing concepts of 3D modelling.
CO3: Demonstrate roles as a leader that been able to plan, coordinate and managing task and resources.

BCM3163
COMPUTER GAMES PROGRAMMING
Credit Hour: 3
Prerequisite: BCI1023 PROGRAMMING TECHNIQUES

Synopsis:

This course will expose students to the theoretical and fundamental concepts of games design,

development and documentation. Topics to be covered are game design and documentation, game space, 3D in game, platforms, and user interaction/input.
Course Outcome:
By the end of semester, students should be able to:
CO1: Analyze various components in game application and development across diverse game genre and platform.
CO2: Construct a basic game design based on fundamental concepts of game development.
CO3: Demonstrate critical thinking during interactive game development.

BCI3283
MOBILE APPLICATION DEVELOPMENT
Credit Hour: 3
Prerequisite: BCS2143 OBJECT ORIENTED PROGRAMMING

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: Analyze the limitations and challenges in mobile applications.
CO2: Construct a mobile application using selected software development environment.
CO3: Demonstrate ability to recognize and respect group member's attitude, act and belief.

BCM3103
VIRTUAL REALITY
Credit Hour: 3
Prerequisite: None

Synopsis:

This module 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 learn about the virtual reality architecture, hardware and software, modelling, augmented reality and applications of virtual reality in various fields.
Course Outcome:
By the end of semester, students should be able to:
CO1: Demonstrate conceptual understanding of virtual reality, regardless of the programming language used.
CO2: Construct virtual reality application by implementing concepts of virtual reality.
CO3: Work in team and undertake the role of a leader and a group member interchangeably.

BCN3213
EMBEDDED SYSTEM
Credit Hour: 3
Prerequisite: None

Synopsis:

In this course, student will learn the fundamental of cyber-physical systems in embedded systems. In the Internet of Things (IoT) world, the interfaces between these worlds are inspired by and derived from information technology.The mechanisms by which software interacts with the physical world are changing rapidly. Today, the trend is towards “smart” sensors and actuators, which carry microprocessors,network interfaces, and software that enables remote access to the sensor data and remote activation of the actuator. This course emphasized both theory and technique in utilizing microprocessors, sensors and actuators in creating a cyber-physical system through programming techniques and networks in IoT world. Through this course, students should be able to design, construct and analyze their own cyber-physical system as a part of IoT technology.

Course Outcome:

By the end of semester, students should be able to:
CO1: Describe the fundamental of cyber-physical system of embedded System, that involve integration of computation with physical process.
CO2: Design, construct and analyse a cyber-physical system of embedded system.
CO3: Apply and demonstrate solutions in problems occurred when utilizing a cyber-physical system of embedded system.

BCN3233
FORENSIC COMPUTING
Credit Hour: 3

Prerequisite: None

Synopsis:

The primary focus of this course is to teach the students the principle knowledge about the current techniques of forensic and cybercrime investigation (FCInv). These techniques will assist students to successfully identify, secure, analyze and present digital evidence. This course will enable students to practice the acquired knowledge in the field of FCInv, which simultaneously fulfils the requirements of IR4.0.

Course Outcome:

By the end of semester, students should be able to:
CO1: Analyze and conduct a FCInv examination and report the findings that are suitable for use by counsel bot in civil and criminla matters.
CO2: Illustrate FCInv techniques to identify, acquire, secure, and analyze possible digital evidence at a suspected cybercrime scene.
CO3: Practice life long learning initiatives in completing the given tasks.

BCN3113
ETHICAL HACKING
Credit Hour: 3
Prerequisite: None

Synopsis:

In this course, students begin with understanding how perimeter defenses work and they are led into scanning and attacking their own networks, no real network is harmed. Students then learn how hackers escalate privileges and what steps can be taken to secure a system. The interactive lab-environment provides each student in-depth knowledge and practical experience with the current security systems. This course will enable students to practice the acquired knowledge in the field of EH, which simultaneously fulfils the requirements of IR4.0.

Course Outcome:

By the end of semester, students should be able to:
CO1: Inquire and analyze theory and principles of information security, element of security, hacking cycle, hacktivsm and ethical hacking.
CO2: Construct attack and defense methods into computer and network environments.
SO3: Relate their surrounding environment (i.e. economy, environmental, cultural) with the professional practice by demonstrating usage of data and ethical hacking methods and tools.

BCN3223
CRYPTOGRAPHY
Credit Hour: 3
Prerequisite: None

Synopsis:

In this course, classical and modern cryptography are taught in detail, from basic block and stream cyphers through to systems based on elliptic and hyperelliptic curves, accompanied by concise summaries of the necessary mathematical background. This course will enable students to practice the acquired knowledge of various cryptographic methods associated with authentication and protocol-sharing which simultaneously fulfils the requirements of IR4.0.

Course Outcome:

By the end of semester, students should be able to:
CO1: Analyze cryptography fundamentals and its applications.
CO2: Construct secure communication using various cryptographic methodology.
CO3: Practice life-long learning initiatives in practice the acquired knowledge of various cryptographic methods associated with authentication and protocol-sharing.

BCS3433
SOFTWARE ARCHITECTURE FOR AUTONOMUS SYSTEMS
Credit Hour: 3
Prerequisite: None

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.
CO2: Design an autonomous system to meet the users requirements.
CO3: Work effectively as part of a team to design an autonomous system static and run-time structure.

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: Classify and distinguish between each business processes in their fields and how they compliments each other in the term of information sharing and exchange.
C02: Navigate and organize all given business processes information and manage the SAP Application.
CO3: Propose and present advice and implementation for an enterprise by using Enterprise Resource Planning concepts.

BCS3443
CYBER-PHYSICAL SYSTEMS MODELLING AND DESIGN
Credit Hour: 3
Prerequisite: None

Synopsis:

This course introduces Smart 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.
CO2: Model and design a system with sensing, actuating and embedded processing components corresponding to requirements.
CO3: Work effectively as part of a team to model and design a cyber-physical system.

BCM3253
DATA ANALYTICS AND VISUALIZATION
Credit Hour: 3
Prerequisite: None

Synopsis:

This course exposes student 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.

Course Outcome:

By the end of semester, students should be able to:
CO1: Analyze the concept of data analytics and visualization in various applications.
CO2: Construct a visualization application by implementing data analytics and visualization techniques.
CO3: Shows the ability for independence learning and propose the suitable solutions to facilitate stakeholder decision making.

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 history of the area, hardware technologies involved, interaction techniques, design guidelines, evaluation methods, and specific application areas.

Course Outcome:

By the end of semester, students should be able to:
CO1: Understand the concept of augmented reality and analyze related information into its components.
CO2: Construct an augmented reality application based on fundamental concepts of augmented reality development.
CO3: Demonstrate the ability to plan, give clear instruction and coordinate tasks & resources based on task objectives during AR project development.

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, students should be able to:
CO1: To demonstrate understanding in the emerging trends in ICT.
CO2: To organize effective approaches in gathering up-to-date information and trends in ICT.
CO3: To demonstrate effective skill in presenting emerging trends in ICT (oral)
CO4: To demonstrate effective skill in presenting emerging trends in ICT (written)

BCC3012
UNDERGRADUATE PROJECT I
Credit Hour: 3
Prerequisite: None

Synopsis:

This course aim 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, analyze 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 report proposal 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: Analyze a specific problem and design the proposed solutions that comply with principles of computer science.
CO2: Organize the solution based on specific problem and usage of appropriate tools to be used in the development of the solution.
CO3: Explore and find solution through independent work.
CO4: Present the solution through oral and written form in order to defend their proposal.
CO5: Demonstrate professional values and attitude through meeting and punctuality in any form of deliverables.

BCC3024
UNDERGRADUATE PROJECT II
Credit Hour: 3
Prerequisite: BCC3012 UNDERGRADUATE PROJECT I

Synopsis:

This course aim 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, analyze 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 report proposal 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: Develop the solution based on the approved proposal (PSM1) which comply with the

principles of computer science.
CO2: Organize an appropriate validation and verification tasks for the propose solution.
CO3: Identify and critically discuss the solution for future values.
CO4: Organize and justify the solution through oral and written form.
CO5: Demonstrate professional values and attitude through meeting and punctuality in any form of deliverables.

BCC4012
INDUSTRIAL TRAINING
Credit Hour: 3
Prerequisite: None

Synopsis:

This course aim 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 regular entries describing the work they are undertaking. Student also supervised by industrial and university supervisor to guide and ensure that they can do their work as good as possible and achieved the objective for this course.

Course Outcome:

By the end of semester, students should be able to:
CO1: Organize the industrial training knowledge, experience and skills in appropriate written report.
CO2: Construct solution by applying the theory learned to solve real problem in organization.
CO3: Build communication skills on oral presentation.
CO4: Work effectively with good critical thinking and problem solving in organization to perform task given.
CO5: Practice interpersonal skills and professional ethics in organization.

اونيبورسيتي مليسيا ڤهڠ
UNIVERSITI MALAYSIA PAHANG

FACULTY OF ELECTRICAL & ELECTRONICS ENGINEERING TECHNOLOGY

UNDERGRADUATE PROSPECTUS 2021/2022

BACHELOR OF ENGINEERING TECHNOLOGY (ELECTRICAL) WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF ENGINEERING TECHNOLOGY (ELECTRICAL) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**
COURSES	BTU1113 Physics	BUM1223 Calculus	BUM2113 Applied Mathematics	BTM3234 Manufacturing Computer Applications	BTM3912 Engineering Ethics	BTM3514 Computer Integrated Manufacturing	BTE4743 Power Electronics	BTE4912 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	
	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		UQ*2**1 Co-curriculum 2	UHS1022 Soft Skills			
	UQB1**1 Co-curriculum 1							
TOTAL CREDIT PER SEMESTER	**19**	**19**	**19**	**18**	**18**	**18**	**18**	**12**
OVERALL TOTAL CREDIT FOR GRADUATION	**142**							

The information provided by Faculty of Electrical & Electronics Engineering Technology are based on University's Regulation and endorsement until 12 March 2020

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
Total minimum credits of elective courses for graduation			**9**

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

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.

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 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.

<u>CORE PROGRAM</u>

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

BTE1112
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

BTE1113
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 concepts and engineering methods of DC circuit analysis. It is also introduce the concept of AC circuits. 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, Measure capacitance, measure capacitor charge and discharge times, RL, RC circuits, phase difference, measure power in a single phase circuit and responses of basic First Order circuits.

Course Outcome

CO 1 Build various electrical circuits and properly use lab equipment to measure, analyse and troubleshoot the circuits. [PO1]
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 [PO2, PO5]
CO 3 Write lab reports in proper format to report work clearly and concisely.
CO 4 Demonstrate the role of individual in team to achieve task completion.

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 problems using various methods of DC Analysis and Network Theorems
CO 2 Describe the effects of DC transients on capacitors and inductors, and to relate them with electromagnetism concept
CO 3 Examine the AC (current and voltage) characteristics, and the concept of impedance in R,L,C circuits
CO 4 Describe the real industrial practice.

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 Apply and validate circuit analysis theorems in ac circuits. [PO1, P2]
CO 2 Identify simple first-order filters and determines the resonant frequency and bandwidth for series/ parallel resonant circuits. [PO4, P3]
CO 3 Identify the functions and applications of transformers and introduce the Non-sinusoidal Waveforms and the 3 phase concept. [PO2, P4]

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 Determine impedance, voltage, current and other basic values for ac circuits.
CO 2 Apply circuit analysis theorems in ac circuits.
CO 3 Identify simple first-order filters and determines the resonant frequency and bandwidth for series/ parallel resonant circuits.
CO4 Identify the functions and applications of transformers and introduce the Non-sinusoidal Waveforms and the 3 phase concept.

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

Diode characteristics, Half wave and full wave rectifiers, Zener characteristics, Zener Voltage regulators, BJT characteristics, CE amplifier, MOSFET characteristics, CS amplifier.

Course Outcome

CO 1 Measure electronics devices characteristics.
CO 2 Construct electric circuits. Use lab equipment and Measure Electronics parameters in this circuits.
CO3 Build and simulate the operation of electric circuit.

BTE2113
Analog Electronics
Credit:3
Prerequisites: BTE2233

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 Understanding the electronics devices (Transistors, Op-Amp) theories.
CO 2 Analysing the electronics circuits.
CO3 Designing the electronics circuits.

BTE3222
Digital Logic Design Laboratory
Credit:2
Prerequisites: None

Synopsis

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.

Course Outcome

CO 1 To demonstrate the applications of digital logic simplification techniques
CO 2 Apply basic gates, flip flops and digital circuit
CO 3 Construct and analyse logic system, counter, decoder, memory devices and multiplexer.
CO 4 Demonstrate the report writing skills in technical field
CO 5 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 technology. Then they are exposed to both combinational logic network and combinational 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 Outcome

CO 1 Apply various techniques for digital logic simplification
CO 2 Apply basic gates, flip flops and various basic digital circuit
CO 3 Analyse logic system, counter, decoder, memory devices and multiplexer

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
CO 2 Design a switching circuit for electrical automation system
CO 3 Construct a control circuit which consists of electrical and electronic components
CO 4 Work in a team and communicate effectively.

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 Describes the basic principles of selected electrical machines.
CO 2 Displays the transformer and machines equivalent circuits and the operating conditions for electrical machines under steady state conditions

CO 3 Construct driver circuit for DC and AC motor
CO 4 Justify the importance of electrical machines and impacts to the Load.
CO 5 Measure, Determine and interpret the parameters of transformer and torque-speed characteristics of rotating machines.

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.

CO 2 Construct driver circuit for DC and AC motor
CO 3 Justify the importance of electrical machines and impacts to the environment.
CO 4 Measure, Determine and interpret the parameters of transformer and torque-speed characteristics of rotating machines.

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

Course Outcome

CO 1 Demonstration of various components of electronic communication system.
CO 2 Demonstrate the understanding of signal generation using available integrated circuits.
CO 3 Demonstrate the understanding of various type of modulation and demodulation process.
CO 4 Work in a team effectively as an individual and in a group

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, type of oscillators, amplitude modulation and angle modulations, as well as single-sideband communication systems.

Course Outcome

CO 1 Interpret the basic concept and understanding in communication design system.
CO 2 Analyse and differentiate various type of modulation and demodulation techniques
CO 3 Measure the parameters for various types of modulation and demodulation
CO 4 Work in a team effectively as an individual and in a group

BTE3252
Microprocessor and Interfacing Laboratory
Credit:2
Prerequisites: None

Synopsis

This course in an introduction to microprocessors. Students are exposed to the internal architecture of the microprocessor, various instruction sets, and basic hardware design of microprocessor-based.

Course Outcome

CO 1 Explain the architecture of the microprocessor system and its interface [PO1 P2]
CO 2 Manipulates the M68000 instruction sets [PO3, P4, CTPS4]
CO 3 Develop a program in a microprocessor system by using an assembly language [PO3, P5, CTPS5]
CO 4 Design and build a simple hardware based on the M68000 processor [PO11, P7, CTPS 4]

BTE2413
Electrical Power System
Credit:3
Prerequisites: BTE3142 & BTE3143

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 Outcome

CO 1 Compute load factor and load demand [PO1, C4].
CO 2 Determine the cost of electricity using the basic concept of electricity tariff and energy efficiency [PO1, C4].
CO 3 Develop the component representation of any balanced three phase power system using per-unit system [PO2, C5].
CO 4 Measure and calculate the performances of power transmission lines [PO3, P4, CTPS3].
CO 5 Work in team effectively [PO8, A3, TS3, and LS2].

BTE3254
Microprocessor and Interfacing
Credit:4
Prerequisites: None

Synopsis

This course in an introduction to a microprocessor. Students are exposed to the internal architecture of the microprocessor, various instruction sets, and basic hardware design of microprocessor-based.

Course Outcome

CO 1 Illustrate the architecture of the microprocessor system and its interface [PO1 C3]
CO 2 Interpret the M68000 instruction sets [PO1 C8]
CO 3 Develop a program in a microprocessor system by using an assembly language [PO2 C5]
CO 4 Design and build a simple hardware based on the M68000 processor [PO11, P7, CTPS 4]

BTE3322
Control System Laboratory
Credit:2
Prerequisites: BTE2113 & 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 analysis design of compensator.

Course Outcome

CO 1 Explain fundamental concept of control systems. [PO3, P2]
CO 2 Display mathematical model and transfer function of physical systems. [PO2, P5]
CO 3 Measure control system performance in terms of transient and steady-state of a linear time invariant systems. [PO3, P5]
CO 4 Alter a compensator to meet specifications in frequency domain. [PO4, P6]
CO 5 Utilize Computer aided tools for control system analysis and design. [PO10, A4, LL3]

BTE3323
Control System
Credit:3
Prerequisites: BTE2113 & 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 analysis design of compensator.

Course Outcome

CO 1 Acquire fundamental concept of control systems.
CO 2 Derive and manipulate mathematical model and transfer function of physical systems.
CO 3 Analyze control system performance in terms of transient and steady-state of a linear time invariant systems.
CO 4 Design a compensator to meet specifications in frequency domain.
CO 5 Utilize Computer aided tools for control system analysis and design.

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 Propose background study, problem statement, objective and scopes of the research
CO 2 Practice positive attitude in research activities
CO 3 Present the research proposal and cited latest publications on the subject

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: BTE2112 & 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 converters, PWM switching techniques, DC and induction motor drives.

Course Outcome

CO 1 Investigate switching characteristics of

basic solid state power devices, operating principles, advantages and disadvantages of basic power electronic technologies
CO 2 Analyse characteristics parameters and evaluate the operation of power electronic converter topologies
CO 3 Construct power electronic converters to meet functional objectives
CO 4 Construct electrical drives using electronic converter

BTE4826
Engineering Technology Senior Design Project II
Credit:6
Prerequisites: BTE3813

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 Analyze data, discuss and conclude the findings
CO 2 Manage the research work
CO 3 Practice positive attitude in research activities
CO 4 Present the research report and cited latest publications on the subject

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 Show and classify in-depth the industrial structure and organization and to understand roles of typical personnel in that particular industry.[PO2,C3]
CO 2 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 .[PO3,P5,CTPS3]
CO 3 Practice the professionalism and work etiquette that comply to good and responsible engineer.[PO6,A5,EM2]
CO 4 Demonstrate management/leadership skills to lead or manage effectively in a industry environment.
[PO8,A3,TS3]
CO 5 Demonstrate the knowledge and ability to search and retrieve information and materials related to the industrial needs.
[PO10,A3,LL2]
CO 6 Arrange and display data and relevant information with a systematic approach.[PO6,A4,EM3]
CO 7 Explain and organize the industrial training experience through written communication.[PO7,P5,CS4]

ELECTIVE COURSES

BTE4713
Programmable Logic Controller
Credit:3
Prerequisites: BTE3223 & BTE3222

Synopsis

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

BTE4723
Advanced Electronics Circuits
Credit:3
Prerequisites: BTE2112 & BTE2113

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 Solve advanced electronics circuit problems
CO 2 Design the advanced electronics circuits
CO 3 Build practically advanced electronic circuits
CO 4 Examine the operation of advanced electronic circuit using software tools (EWB)

BTE4733
Sensor Technology
Credit:3
Prerequisites: BTU1113

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 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
CO 4 Choose potential sensor for environment detection and monitor

BACHELOR OF ELECTRONICS ENGINEERING TECHNOLOGY (COMPUTER SYSTEM) WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF ELECTRONICS ENGINEERING TECHNOLOGY (COMPUTER SYSTEM) WITH HONOURS

SEMESTER	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**
COURSES	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	
	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		UQ*2**1 Co-Curriculum II	UGE2002 Technopreneurship	BTS3122 Computer Architecture Laboratory			
	UQB1**1 Co-Curriculum I							
TOTAL CREDIT	**18**	**18**	**17**	**18**	**20**	**19**	**19**	**12**
TOTAL CREDIT FOR GRADUATION	**141**							

The information provided by Faculty of Electrical & Electronics Engineering Technology are based on University's Regulation and endorsement until 12 March 2020

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
TOTAL MINIMUM CREDITS OF ELECTIVE COURSES FOR GRADUATION			**9**

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 internationals 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

COURSE SYNOPSIS

BACHELOR OF ELETRONICS 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: 2
Prerequisit: 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.

<u>CORE PROGRAM</u>

BTE2122
Electrical Fundamentals and Circuit Analysis I Laboratory
Credit: 2
Prerequisites: None

Synopsis

This course introduces the basic concepts and engineering methods of DC circuit analysis. It is also introduce the concept of AC circuits. 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, Measure capacitance, measure capacitor charge and discharge times, RL, RC circuits, phase difference, measure power in a single phase circuit and responses of basic First Order circuits.

Course Outcome

CO 1 Build various electrical circuits and properly use lab equipment to measure, analyse and troubleshoot the circuits. [PO1]
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 [PO2, PO5]
CO 3 Write lab reports in proper format to report work clearly and concisely.
CO 4 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 Describe the effects of DC transients on capacitors and inductors, and to relate them with electromagnetism concept
CO 3 Examine the AC (current and voltage) characteristics, and the concept of impedance in R,L,C circuits
CO 4 Describe 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 Apply and validate circuit analysis theorems in ac circuits. [PO1, P2]
CO 2 Identify simple first-order filters and determines the resonant frequency and bandwidth for series/ parallel resonant circuits. [PO4, P3]
CO 3 Identify the functions and applications of transformers and introduce the Non-sinusoidal Waveforms and the 3 phase concept. [PO2, P4]

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 Determine impedance, voltage, current and other basic values for ac circuits.
CO 2 Apply circuit analysis theorems in ac circuits.
CO 3 Identify simple first-order filters and

determines the resonant frequency and bandwidth for series/ parallel resonant circuits.
CO4 Identify the functions and applications of transformers and introduce the Non-sinusoidal Waveforms and the 3 phase concept.

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.

BTM1314
Computer-Aided Design
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.

BTE2212
Electronics I Laboratory
Credit:2
Prerequisites: BTE2133

Synopsis

Diode characteristics, Half wave and full wave rectifiers, Zener characteristics, Zener Voltage regulators, BJT characteristics, CE amplifier, MOSFET characteristics, CS amplifier.

Course Outcome

CO 1 Measure electronics devices characteristics.
CO 2 Construct electric circuits and measure electronics parameters.
CO 3 Build and simulate the operation of electric circuit.

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 Explain the electronics devices (Transistors, Op-Amp) theories.
CO 2 Analyze the electronics circuits.
CO 3 Design the electronics circuits.

BTE3222
Digital Logic Design Laboratory
Credit:2
Prerequisites: None

Synopsis

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.

Course Outcome

CO 1 To demonstrate the applications of digital logic simplification techniques
CO 2 Apply basic gates, flip flops and digital circuit
CO 3 Construct and analyse logic system, counter, decoder, memory devices and multiplexer.

CO 4 Demonstrate the report writing skills in technical field
CO 5 Work in a team and communicate effectively

BTE3222
Digital Logic Design
Credit:3
Prerequisites: None

Synopsis

This course introduces students to the fundamentals 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 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 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 Build a digital logic circuit for small project and demonstrate the report writing skills in technical field
CO 4 Work in a team and communicate effectively

BTE3242
Electronics II Laboratory
Credit:2
Prerequisites:BTE2213

Synopsis

Frequency response, multi stage Amplifiers, Differential Amplifier characteristics with differential and common inputs, Current source design, Ideal and Non Ideal OPAMP characteristics, Inverting Amplifier and Non-inverting Amplifier, Operational Amplifier Circuits (Comparator, Summation, Subtractor, Integrator, Differentiator, 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
CO 3 Build and simulate the operation of electric circuit.

BTE3243
Electronics II
Credit:3
Prerequisites:BTE2213

Synopsis

Class A Power Amplifiers, Class B and AB Power Amplifiers, Differential Amplifier characteristics with differential and common inputs, Current source design, Ideal and Non Ideal OPAMP characteristics, Inverting Amplifier and Non-inverting Amplifier, Feedback in the Non-inverting and Inverting Amplifiers, Input and output impedance in the Non-inverting and Inverting amplifier, The Gain-Bandwidth Product, Operational Amplifier Circuits Analysis (Comparator, Summation, Subtractor, Scaling, Integrator, Differentiator, Active Low-Pass Filter, Active High-Pass Filter, Active Band-pass Filter, Active Band-Stop Filter, Digital-to-Analog Converter (DAC) and Analog-to-Digital Converter (ADC).

Course Outcome

CO 1 Explain the electronics devices (Transistors, Op-Amp) theories.
CO 2 Analyze the electronics circuits.
CO 3 Design the electronics circuits.

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 their applications.
CO 2 Select 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 Manipulate ideas on how the computer vision system works through group presentation.
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

Course Outcome

CO 1 Demonstration of various components of electronic communication system.
CO 2 Demonstrate the understanding of signal generation using available integrated circuits.
CO 3 Demonstrate the understanding of various type of modulation and demodulation process.
CO 4 Work in a team effectively as an individual and in a group.

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, type of oscillators, amplitude modulation and angle modulations, as well as single-sideband communication systems.

Course Outcome

CO 1 Interpret the basic concept and understanding in communication design system.
CO 2 Analyse and differentiate various type of modulation and demodulation techniques
CO 3 Measure the parameters for various types of modulation and demodulation
CO 4 Work in a team effectively as an individual and in a group

BTE3252
Microprocessor and Interfacing Laboratory
Credit:2
Prerequisites: BTE3223

Synopsis

This course in an introduction to microprocessors. Students are exposed to the internal architecture of the microprocessor, various instruction sets, and basic hardware design of microprocessor-based.

Course Outcome

CO 1 Explain the architecture of the microprocessor system and its interface [PO1 P2]
CO 2 Manipulates the M68000 instruction sets

[PO3, P4, CTPS4]
CO 3 Develop a program in a microprocessor system by using an assembly language [PO3, P5, CTPS5]
CO 4 Design and build a simple hardware based on the M68000 processor [PO11, P7, CTPS 4]

BTE3253
Microprocessor and Interfacing
Credit:3
Prerequisites: 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, program developing for applications in embedded systems using C language and basic hardware design of embedded systems basic hardware design of microprocessor-based.

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 programs for applications in embedded systems using “c” language.
CO 3 Build a project using microcontroller & demonstrate the report writing skills in technical field.
CO 4 Demonstrate the role of individual in team to achieve task completion.

BTS3112
Numerical & Control Systems Laboratory
Credit:2
Prerequisites: None

Synopsis

This course introduces 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 PC 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 introduces 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 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.
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

This course introduces the concepts Computer arithmetic and ALU design, Data path 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, networks of multiprocessors, parallel programming and Performance issues.

Course Outcome

CO 1 Design and emulate a single cycle or pipelined CPU by given specifications using Hardware Description Language (HDL).
CO 2 Develop projects on computer architecture elements.
CO 3 Write reports and make presentations of computer architecture projects.

BTS3123
Computer Architecture
Credit:3
Prerequisites: None

Synopsis

This course introduces the architecture of the computer 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, data path 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 fundamentals of different instruction set architecture and their relationship to the CPU.
CO 2 Understand the principles and the implementation of computer arithmetic.
CO 3 Understand the operation of modem CPUs including pipelining, memory systems and buses.
CO 4 Understand the principles of operation of multiprocessor systems and parallel programming.

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 course introduces the application of embedded systems. This includes exposure to the internal architecture of the Microcontrollers using Motorola M68HC11, various instruction sets and basic hardware design of Microcontrollers-based. They will learn how to program the Microcontroller using assembly and C language.

Course Outcome

CO 1 Illustrate the architecture of the microcontroller.
CO 2 Interpret the M68HC11 instruction sets.
CO 3 Develop a firmware using assembly language
CO 4 Design a basic hardware based on 68HC11 microcontroller.
CO 5 Work in a team and communicate effectively.

BTS3143
Microcontrollers & Embedded Systems
Credit:3
Prerequisites: BTE3253

Synopsis

This course is an introduction to Microcontrollers. Students are exposed to the internal architecture of the Microcontrollers, various instruction sets and basic hardware design of Microcontrollers-based. They will learn how to program the Microcontroller using assembly and C language.

Course Outcome

CO 1 Explain the principles, operation and function of microcontroller system.
CO 2 Create applications program for specific task.
CO 3 Develop & test programming for high level language.
CO 4 Construct interface electronics circuit to control the external devices.

BTS3152
PLC Basics and Applications Laboratory
Credit:2
Prerequisites: BTE3223

Synopsis

This course introduces 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 Explain and 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 Illustrate input and output component and principles used of simple manufacturing applications.
CO 4 Develop a program to operate the manufacturing applications.
CO 5 Practices right attitude and safety procedures.

BTS3153
PLC Basics and Applications
Credit:3
Prerequisites: BTE3223

Synopsis

This course introduces the fundamental of Programmable Logic Controller (PLC) including input and output component, memory address, wiring diagram, troubleshooting and design of ladder diagram. The student will learn on how to design the PLC 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 Propose background study, problem statement, objective and scopes of the research
CO 2 Practice positive attitude in research activities
CO 3 Present the research proposal and cited latest publications on the subject

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 Propose background study, problem statement, objective and scope of the research.
CO 2 Practice positive attitude in research activities.
CO3 Present the research proposal and cited latest publications on the subject.

BTS4826
Engineering Technology Senior Design Project II
Credit:6
Prerequisites: BTS3813

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 Analyze data, discuss and conclude the findings
CO 2 Manage the research work
CO 3 Practice positive attitude in research activities
CO 4 Present the research report and cited latest publications on the subject

BTS4919
Industrial Training
Credit:9
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 Show and classify in-depth the industrial structure and organization and to understand roles of typical personnel in that particular industry
CO 2 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
CO 3 Practice the professionalism and work etiquette that comply to good and responsible engineer.
CO 4 Demonstrate management/leadership skills to lead or manage effectively in a industry environment.
CO 5 Demonstrate the knowledge and ability to search and retrieve information and materials related to the industrial needs.

BTS4913
Industrial Training Report
Credit: 3
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 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 Arrange and display data and relevant information with a systematic approach
CO 2 Explain and organize the industrial training experience through written communication

<u>ELECTIVE COURSES</u>

BTS4713
Advanced Microprocessor
Credit:3
Prerequisites: BTE3253

Synopsis

This course introduces software details of the 68000, exception processing, hardware details of the 68000, memory system design, I/O system design, building a working 68000 system and introduction to the advanced 680X0 series microprocessors.

Course Outcome

CO 1 Analyze the principles of the 68000 including the details of software and hardware
CO 2 Analyze the principles of the advanced 680X0 series microprosessors
CO 3 Design working 68000 and 680X0 system that include memory and I/O systems design

BTS4723 Software Engineering
Credit:3
Prerequisites: None

Synopsis

This course introduces the essential knowledge of software engineering dealing with the theories, methods and tools for professional software development. This course covers the definition, implementation, assessment, measurement, management, change and improvement of the software engineering process.

Course Outcome

CO 1 Understanding the process of professional software development in software engineering
CO 2 Analyze the theories and different methods and tools for professional software development
CO 3 Develop the professional software development using different methods and tool.

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 Analyze the principles of internet and world wide web

CO 2 Construct internet based applications using Java Scripts programming language.

CO 3 Design web applications with enhanced features using various programming technique

BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY (POWER & MACHINE) WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY (POWER & MACHINE) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
COURSES	BTU1113 Physics	BUM1223 Calculus	BTM2014 Manufacturing Computer Applications	BTM1314 Computer-Aided Design	BTM3343 Computer Integrated Manufacturing	BTE3313 Power System Protection & High Voltage	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	BTE3253 Microprocessor and Interfacing	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	BTE3052 Microprocessor and Interfacing Lab	BTW4**3 Elective II	
	BTU1212 Chemistry Lab	BTE2313 Computer Programming	BTE3143 Electrical Machine and Transformer	BTW2243 Advanced Electric Machines	BTE3242 Control System Lab	BTW3113 Power System Analysis	BTW4**3 Elective III	
	BUM1113 Technical Mathematics	UHC1012 Falsafah dan Isu Semasa	BTE3142 Electrical Machine and Transformer Laboratory	BTW2242 Advanced Electric Machines Laboratory	BTW3213 Power Electronic Drive Machine	BTW3223 Electrical Installation Design	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	BTW3222 Electrical Installation Design Lab		
	BTE2122 Electrical Fundamentals and Circuit Analysis I Laboratory	UHS1022 Soft-Skills	UGE2002 Technopreneurship	UHF11*1 Foreign Language I	BTW3632 Maintainance Technology	BTW3813 Engineering Technology Senior Design Project I		
	UHL2400 Fundamentals of English Language	UHL2412 English for Academic Communication		UQ*2**1 Co-curriculum 2	UHF21*1 Foreign Language II			
	UQB1**1 Co-curriculum I							
TOTAL CREDIT PER SEMESTER	19	19	19	18	19	19	18	12
OVERALL TOTAL CREDIT FOR GRADUATION	143							

The information provided by Faculty of Electrical & Electronics Engineering Technology are based on University's Regulation and endorsement until 12 March 2020

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
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 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

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

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: 2
Prerequisit: 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 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.

BTU2413
Applied Statistics

Credit:3
Prerequisites:None

Synopsis

Students are exposed to statistics including statistical problem-solving methodology and descriptive statistic, probability distributions commonly used in practice, sampling distribution and confidence interval, hypothesis testing, analysis of variance (ANOVA), goodness of fit test 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
CO 1 Analyze data using statistical theory and methodology, and recommend a conclusion or suggestion based on the analyzed data.
CO 2 Perform statistical data analysis by using appropriate software tools.
CO 3 Apply statistical concepts and methods learned to solve any related problems in various scientific diciplines.
CO 4 Relate and apply the techniques and methods studied into other courses

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

BTE2122
Electrical Fundamentals and Circuit Analysis I Laboratory
Credit:2
Prerequisites: None

Synopsis

parallel circuits, Mesh and Nodal analysis, superposition theorem, Thevenin and Norton equivalent of a complex circuit, Measure capacitance, measure capacitor charge and discharge times, RL, RC circuits, phase difference, measure power in a single phase circuit and responses of basic First Order circuits.

Course Outcome

CO 1 Build various electrical circuits and properly use lab equipment to measure, analyse and troubleshoot the circuits. [PO1]
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 [PO2, PO5]
CO 3 Write lab reports in proper format to report work clearly and concisely.
CO 4 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 Describe the effects of DC transients on capacitors and inductors, and to relate them with electromagnetism concept
CO 3 Examine the AC (current and voltage) characteristics, and the concept of impedance in R,L,C circuits
CO 4 Describe the real industrial practice.

BTE2222
Electrical Fundamentals and Circuit Analysis II Laboratory
Credit:2
Prerequisites: 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 Apply and validate circuit analysis theorems in ac circuits. [PO1, P2]
CO 2 Identify simple first-order filters and determines the resonant frequency and bandwidth for series/ parallel resonant circuits. [PO4, P3]
CO 3 Identify the functions and applications of transformers and introduce the Non-sinusoidal Waveforms and the 3 phase concept. [PO2, P4]

BTE2233
Electrical Fundamentals and Circuit Analysis II
Credit:3
Prerequisites: BTE2223

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 Describe the effects of DC transients on capacitors and inductors, and to relate them with electromagnetism concept
CO 3 Examine the AC (current and voltage) characteristics, and the concept of impedance in R,L,C circuits
CO 4 Describe the real industrial practice.

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 Apply and validate circuit analysis theorems in ac circuits. [PO1, P2]
CO 2 Identify simple first-order filters and determines the resonant frequency and bandwidth for series/ parallel resonant circuits. [PO4, P3]
CO 3 Identify the functions and applications of transformers and introduce the Non-sinusoidal Waveforms and the 3 phase concept. [PO2, P4]

BTE2233
Electrical Fundamentals and 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 Determine impedance, voltage, current and other basic values for ac circuits.
CO 2 Apply circuit analysis theorems in ac circuits.
CO 3 Identify simple first-order filters and determines the resonant frequency and bandwidth for series/ parallel resonant circuits.
CO4 Identify the functions and applications of transformers and introduce the Non-sinusoidal Waveforms and the 3 phase concept.

BTM1314
Computer-Aided Design
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.

BTM2014
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.

BTE3142
Electrical Machines and Transformers Laboratory
Credit:2
Prerequisites: None

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 Describes the basic principles of selected electrical machines.
CO 2 Displays the transformer and machines equivalent circuits and the operating conditions for electrical machines under steady state conditions

CO 3 Construct driver circuit for DC and AC motor
CO 4 Justify the importance of electrical machines and impacts to the Load.
CO 5 Measure, Determine and interpret the parameters of transformer and torque-speed characteristics of rotating machines.

BTE3143
Electrical Machines and Transformers
Credit:3
Prerequisites: None

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 Construct driver circuit for DC and AC motor
CO 3 Justify the importance of electrical machines and impacts to the environment.
CO 4 Measure, Determine and interpret the parameters of transformer and torque-speed characteristics of rotating machines.

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 Estimate electrical load for an installation and design single-line diagram for the installation
CO 3 Explain the protection system used in 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 CADD software..
CO 2 Simulate fault and safety investigation through the use of simulators conditions
CO 3 Design and assemble the different types of professional industrial wiring of 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

BTE3052
Microprocessor and Interfacing Laboratory
Credit:2
Prerequisites: BTE2313 & BTE3223

Synopsis

This course in an introduction to microprocessors. Students are exposed to the internal architecture of the microprocessor, various instruction sets, and basic hardware design of microprocessor-based.

Course Outcome

CO 1 Explain the architecture of the microprocessor system and its interface [PO1 P2]
CO 2 Manipulates the M68000 instruction sets [PO3, P4, CTPS4]
CO 3 Develop a program in a microprocessor system by using an assembly language [PO3, P5, CTPS5]
CO 4 Design and build a simple hardware based on the M68000 processor [PO11, P7, CTPS 4]

BTE3053
Microprocessor and Interfacing
Credit:3
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, program developing for applications in embedded systems using C language and basic hardware design of embedded systems.basic hardware design of microprocessor-based.

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 programs for applications in embedded systems using "c" language.
CO 3 Build a project using microcontroller & demonstrate the report writing skills in technical field.
CO 4 Demonstrate the role of individual in team to achieve task completion.

BTE3222
Digital Logic Design Laboratory
Credit:2
Prerequisites: None

Synopsis

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.

Course Outcome

CO 1 To demonstrate the applications of digital logic simplification techniques
CO 2 Apply basic gates, flip flops and digital circuit
CO 3 Construct and analyse logic system, counter, decoder, memory devices and multiplexer.

CO 4 Demonstrate the report writing skills in technical field
CO 5 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 technology. Then they are exposed to both combinational logic network and combinational 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 Outcome

CO 1 Apply various techniques for digital logic simplification
CO 2 Apply basic gates, flip flops and various basic digital circuit
CO 3 Analyse logic system, counter, decoder, memory devices and multiplexer

BTE2413
Electrical Power System
Credit:3
Prerequisites: None

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 Outcome

CO 1 Compute load factor and load demand [PO1, C4].
CO 2 Determine the cost of electricity using the basic concept of electricity tariff and energy efficiency [PO1, C4].
CO 3 Develop the component representation of any balanced three phase power system using per-unit system [PO2, C5].
CO 4 Measure and calculate the performances of power transmission lines [PO3, P4, CTPS3].
CO 5 Work in team effectively [PO8, A3, TS3, and LS2].

BTE3242
Control System Laboratory
Credit:2
Prerequisites: 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.

Course Outcome

CO 1 Explain fundamental concept of control systems. [PO3, P2]
CO 2 Display mathematical model and transfer function of physical systems. [PO2, P5]
CO 3 Measure control system performance in terms of transient and steady-state of a linear time invariant systems. [PO3, P5]
CO 4 Alter a compensator to meet specifications in frequency domain. [PO4, P6]
CO 5 Utilize Computer aided tools for control system analysis and design. [PO10, A4, LL3]

BTE3243
Control System
Credit:3
Prerequisites: 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.

Course Outcome

CO 1 Acquire fundamental concept of control systems.
CO 2 Derive and manipulate mathematical model and transfer function of physical systems.
CO 3 Analyze control system performance in terms of transient and steady-state of a linear time invariant systems.
CO 4 Design a compensator to meet specifications in frequency domain.
CO 5 Utilize Computer aided tools for control system analysis and design.

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 Display maintenance performance using CMMS (Computerized Maintenance Management System) software.
CO 5 Demonstrate appropriate and effective

action during plant shutdown.

BTW2242
Advance Electric Machine Laboratory
Credit:2
Prerequisites: None

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 A.C electrical machines..

Course Outcome

CO 1 Displays the simple models of synchronous machine, p.u. system, windings
CO 2 Construct induction machines,
CO 3 Measure, Determine and interpret the parameters of permanent magnet AC machines.

BTW3212
Advance Electric Machine
Credit:3
Prerequisites: None

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 A.C electrical machines,
CO 3 Construct driver circuit for AC motor.
CO 4 Justify the importance of A.C electrical machines and impacts to the industry.
CO 5 Measure, Determine and interpret the parameters of transformer and torque-speed characteristics of A.C Electrical machines.

BTW3313
Power System Protection and High Voltage
Credit:3
Prerequisites: None

Synopsis

Safety is highly important when dealing with electrical power. Understanding power system protection will be able to ensure safety is covered.

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 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 Investigate switching characteristics of basic solid state power devices, operating principles, advantages and disadvantages of basic power electronic converter topologies.
CO 2 Design power electronic converters using commercially available simulation tools.
CO 3 Construct power electronic converters to meet functional objectives environment.
CO 4 Work effectively in team.
CO 5 Construct electrical drives using electronic converter

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 Propose background study, problem statement, objective and scopes of the research
CO 2 Practice positive attitude in research activities
CO 3 Present the research proposal and cited latest publications on the subject

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.

BTE4826
Engineering Technology Senior Design Project II
Credit:6
Prerequisites: BTE3813

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 Analyze data, discuss and conclude the findings
CO 2 Manage the research work
CO 3 Practice positive attitude in research activities
CO 4 Present the research report and cited latest publications on the subject

BTU4912
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 Show and classify in-depth the industrial structure and organization and to understand roles of typical personnel in that particular industry.[PO2,C3]
CO 2 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 .[PO3,P5,CTPS3]
CO 3 Practice the professionalism and work etiquette that comply to good and responsible engineer.[PO6,A5,EM2]
CO 4 Demonstrate management/leadership skills to lead or manage effectively in a industry environment.
[PO8,A3,TS3]
CO 5 Demonstrate the knowledge and ability to search and retrieve information and materials related to the industrial needs.
[PO10,A3,LL2]
CO 6 Arrange and display data and relevant information with a systematic approach.[PO6,A4,EM3]
CO 7 Explain and organize the industrial training experience through written communication.[PO7,P5,CS4]

BTE4713
Programmable Logic Controller
Credit:3
Prerequisites:

Synopsis

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

<u>ELECTIVE COURSES</u>

BTW47*3
Power System Operation & Control
Credit:3
Prerequisites:

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 Solve advanced electronics circuit problems
CO 2 Design the advanced electronics circuits
CO 3 Build practically advanced electronic circuits
CO 4 Examine the operation of advanced electronic circuit using software tools (EWB)

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 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

اونيۏرسيتي مليسيا ڤهڠ
UNIVERSITI MALAYSIA PAHANG

FACULTY OF INDUSTRIAL MANAGEMENT

UNDERGRADUATE PROSPECTUS 2021/2022

BACHELOR OF PROJECT MANAGEMENT WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF PROJECT MANAGEMENT WITH HONOURS

YEAR	FIRST	SECOND	THIRD	FOURTH
CORE COURSES	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	
102	**21**	**27**	**29**	**25**
18	**University Courses** Co-Curriculum, Technopreneurship, Islamic & Civilization, Ethnic Relation, Foreign Languages, Fundamentals of English Language, English for Academic Communication, English for Professional Communication, English for Technical Communication, Soft Skills			
120	**TOTAL CREDIT FOR GRADUATION**			

The information provided by Faculty of Industrial Management are based on University's Regulation and endorsement until 23 March 2020

ELECTIVE COURSES FOR
BACHELOR OF PROJECT MANAGEMENT WITH HONOURS

ELECTIVES	CODE	COURSE	CREDIT HOUR
CONSTRUCTION	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
INFORMATION TECHNOLOGY	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	
	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)

At the end of the program, graduates must have:

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.
C0 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.

BACHELOR OF INDUSTRIAL TECHNOLOGY MANAGEMENT WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF INDUSTRIAL TECHNOLOGY MANAGEMENT WITH HONOURS

YEAR	FIRST	SECOND	THIRD	FOURTH
COURSES	BPC1113 Principles of Management	BPC2113 Quality Management	BPQ3213 Production Planning & Control	BPC4114 Final Year Project 2
	BPC1143 Industrial Psychology	BPQ2213 Financial Management	BPQ3223 Quality control	BPC4112 Industrial Training
	BPC1123 Principles of Economics	BPQ2223 Supply Chain & Logistics Management	BPC3113 Research Methodology	BPE4513/BPE4813 Elective Course 4
	BPC1133 Principles of Marketing	BPC2123 Organizational Behaviour	BPQ3233 Business Law	BPE4523/BPE4823 Elective Course 5
	BPQ1223 Principles of Operation Management	BPQ2233 Project Management	BPC3123 Strategic Management	BPE4533/BPE4833 Elective Course 6
	BPC1153 Business Information System	BPQ2243 Fundamental of Manufacturing	BPQ3243 Production Development & Innovation	
	BPQ1213 Management Accounting	BPQ2253 Management of Technology	BPC3132 Final Year Project 1	
	BUM1123 Mathematics for Management	BUM2433 Statistics for Management	BPE3513/BPE3813 Elective Course 1	
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18	**University Courses:** 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			
120	**TOTAL CREDIT FOR GRADUATION**			

The information provided by Faculty of Industrial Management are based on University's Regulation and endorsement until 23 March 2020

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)

At the end of the program, graduates must have:

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

BACHELOR OF BUSINESS ENGINEERING WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF BUSINESS ENGINEERING WITH HONOURS

YEAR	FIRST			SECOND		THIRD		FOURTH	
SEMESTER	FIRST	SECOND	LONG SEMESTER BREAK	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
COURSES	BPN1013 Principles of Management	BPN1062 Fundamentals of Project Management	BPN2032 Fundamentals of Marketing	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	BPN2023 Industrial Engineering	BPN2013 Quality 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	BPN2043 Fundamentals of Electrical Engineering	BPN2053 ERP Systems & Business Process Management	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	UHG2012 Deutsche IV	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		BPE41*3 / BPE43*3 Elective (Business) III		BPE42*3 / BPE44*3 Elective (Engineering) III	
	UHG1002 Deutsche I	UHG1012 Deutsche II		UHG2002 Deutsche III		UHE3212 Global Competencies		BPE42*2 / BPE44*2 Elective (Engineering) IV	
	UHC1012 Falsafah dan Isu Semasa	UHC2022 / UHE3082* Penghayatan Etika		UGE2002 Technopreneurship					

The information provided by Faculty of Industrial Management are based on University’s Regulation and endorsement until 23 March 2020

		dan Peradaban / Malaysian Study*							
	UHS1021 Soft Skills 1	UHS2021 Soft Skills 2							
	UQB1**1 CoQ – I	UQ*2**1 CoQ-II							
	UHF2192 Bahasa Melayu Komunikasi*								
TOTAL CREDIT PER SEMESTER	**20**	**18**	**8**	**19**	**13**	**17**	**12**	**16**	**12**
OVERALL TOTAL CREDIT FOR GRADUATITION	**135**								

* Courses taken by International students

ELECTIVE COURSES FOR
BACHELOR OF BUSINESS ENGINEERING WITH HONOURS

<table>
<tr><th>ELECTIVES</th><th>CODE</th><th>COURSE</th><th>CREDIT HOUR</th></tr>
<tr><td rowspan="6">Elective I, II, IV, V (Business)</td><td>BPE4123</td><td>Supply Chain Control & Management Control Systems</td><td>3</td></tr>
<tr><td>BPE4133</td><td>Advanced Project Management & Control</td><td>3</td></tr>
<tr><td>BPE4143</td><td>Lean Management</td><td>3</td></tr>
<tr><td>BPE4153</td><td>Simulation Game</td><td>3</td></tr>
<tr><td>BPE4163</td><td>Technical Planning Case</td><td>3</td></tr>
<tr><td>BPE4313</td><td>Production Accounting & Control</td><td>3</td></tr>
<tr><td rowspan="3">Elective III (Business)</td><td>BPE4112</td><td>Innovation & Technology Management</td><td>2</td></tr>
<tr><td>BPE4122</td><td>HR Management</td><td>2</td></tr>
<tr><td>BPE4132</td><td>International Business Environment</td><td>2</td></tr>
<tr><td rowspan="9">Elective I, II (Engineering)</td><td>BPE4213</td><td>Intra-Logistics</td><td>3</td></tr>
<tr><td>BPE4223</td><td>Distribution Logistics</td><td>3</td></tr>
<tr><td>BPE4233</td><td>International Transport Logistics</td><td>3</td></tr>
<tr><td>BPE4243</td><td>Warehouse & Inventory Planning</td><td>3</td></tr>
<tr><td>BPE4413</td><td>Production Planning & Methods</td><td>3</td></tr>
<tr><td>BPE4423</td><td>Technical Applications & Machines</td><td>3</td></tr>
<tr><td>BPE4433</td><td>Materials Science</td><td>3</td></tr>
<tr><td>BPE4443</td><td>Product Engineering</td><td>3</td></tr>
<tr><td>BPE4453</td><td>Electrical Drives</td><td>3</td></tr>
<tr><td rowspan="3">Elective III (Engineering)</td><td>BPE4212</td><td>Database Systems</td><td>2</td></tr>
<tr><td>BPE4222</td><td>Sustainability/Energy Efficiency</td><td>2</td></tr>
<tr><td>BPE4232</td><td>Power Management (Electrical Grids)</td><td>2</td></tr>
<tr><td colspan="3">Total Credit</td><td>28</td></tr>
</table>

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 analyse 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 strategics 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, warehouser, 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 & 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 learns 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, MRPII, 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 systems

BACHELOR OF BUSINESS ANALYTICS WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF BUSINESS ANALYTICS WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**
CORE COURSES	BPC1113 Principles of Management	BUM2413 Applied Statistics	BPQ2233 Project Management	BPC2123 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)		
					Elective 1 (Business / Manufacturing)			
106	**12**	**9**	**13**	**15**	**18**	**14**	**13**	**12**
18	**University Courses:** 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	**OVERALL TOTAL CREDIT FOR GRADUATION**							

ELECTIVE COURSES FOR

BACHELOR OF BUSINESS ANALYTICS WITH HONOURS

ELECTIVES	CODE	COURSE	CREDIT HOUR
BUSINESS	BPE4913	Customer Analytics	3
	BPE4923	Social Media Analytics	3
	BPE4933	Human Resources Analytics	3
	BPE4943	Financial Modelling & Analytics	3
	BPE4953	Business Forecasting	3
MANUFACTURING	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)

At the end of the program, graduates must have:

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 differentation. 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, Optimazation 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 learns 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 of 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 use 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 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 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 thier own programming codes/ predicitive workflow models in order to solve real world problems for thier project. The students experience the theoretical and practical aspects of data mining knowlegde 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 I mplementation.

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 skils 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
Prerequsite: 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 industriak 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.

اونيبورسيتي مليسيا ڤهڠ
UNIVERSITI MALAYSIA PAHANG

FACULTY OF INDUSTRIAL SCIENCES AND TECHNOLOGY

UNDERGRADUATE PROSPECTUS 2021/2022

BACHELOR OF APPLIED SCIENCE INDUSTRIAL CHEMISTRY WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF APPLIED SCIENCE IN INDUSTRIAL CHEMISTRY WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEM	**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 Instrumentation Technique	BSK4812 Industrial Training
	BCS1023 Programming Techniques	UQB1**1 Co-Curicculum 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	BPQ1223 Principles of Operation Management	BSK2223 Laboratory Quality Management & Validation				
TOTAL CREDIT	**18**	**18**	**18**	**17**	**15**	**16**	**13**	**12**
TOTAL CREDIT FOR GRADUATION	**127**							

The information provided by Faculty of Industrial Sciences and Technology are based on University's Regulation and Endorsement until 27 July 2021

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)

The PEOs for graduates are as follows:

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 equilibriums 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 practice 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 distillation, reforming, cracking, coking and blending. The parameter affecting each process will be discussed. The characterization and analysis of various petroleum feedstocks and products using basic and advanced instruments will be introduce 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 feedstock i.e. C1 to C4 alkanes, olefins and aromatics hydrocarbon. 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 factor 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 reactions mechanism and types of polymers based on reactions category. The general characteristics of polymer, polymerization process, polymer synthesis, specific characteristic of polymer including thermal, morphological and rheological properties. The progress / development of industrial polymers using the 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 demand 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

BACHELOR OF APPLIED SCIENCE INDUSTRIAL BIOTECHNOLOGY WITH HONOURS

CONTENTS

- CURRICULUM STRUCTURE
- PROGRAMME EDUCATIONAL OBJECTIVE (PEO)
- PROGRAMME OUTCOMES (PO)
- COURSE SYNOPSIS

CURRICULUM STRUCTURE

BACHELOR OF APPLIED SCIENCE IN INDUSTRIAL BIOTECHNOLOGY WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEM	**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	BSB2133 Cell and Molecular Biology	BSB2143 Enzyme Technology	BSB3113 Gene Technology	BSB35*3 Elective I	BSB35*3 Elective III	
	BSB1113 Biochemistry	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	BSB2173 Bioanalytical Chemistry	BSB2193 Industrial Microbiology	BSB3123 Bioprocess Technology	UGE2002 Techno-Preneurship		
	BSB1102 Biophysical Chemistry	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			
				BPQ1223 Principles of Operation Management				
TOTAL CREDIT	**18**	**18**	**18**	**18**	**16**	**15**	**12**	**12**
TOTAL CREDIT FOR GRADUATION	**127**							

The information provided by Faculty of Industrial Sciences and Technology are based on University's Regulation and Endorsement until 28 July 2021

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
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)

PEO 1 ： 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

PEO 2 : Communicate effectively in leading and engaging multidisciplinary teams while addressing relevant issues locally and globally

PEO 3 : Explore business opportunities in the bio-based industry locally and globally and utilize ICT to advance their biotechnological knowledge and skills

PEO 4 : Integrate ethical and professional values in managing and providing services to the recipients and providers of the bio-based industry locally and globally

PROGRAMME OUTCOMES (PO)

PO1 : Acquire and apply knowledge relevant to biotechnology

PO2 : Operate and maintain a range of biotechnology instruments

PO3 : Analyse, synthesize, integrate knowledge and information to provide solutions in addressing challenges and concerns, appropriate to biotechnology

PO4 : Conduct basic guided research

PO5 : Communicate ideas scientifically, in verbal and written forms, with communities

PO6 : Deliver responsibilities and demonstrate good interpersonal skills in a team

PO7 : Manage information and engage in life-long learning

PO8 : Manage laboratory and industrial occupational safety and quality

PO9 : Explore business opportunity pertaining to the field of industrial biotechnology

PO10 : Demonstrate understanding and awareness of basic commercial, ethical, legal and social issues related to biotechnology

PO11 : Lead and work efficiently in a multidisciplinary projects team

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 it's 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 session.

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 carbohydrate 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 cell 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 student 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 group to develop team work 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 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 student to introduction policy, scope and research area in industrial biotechnology sector in Malaysia and global scenario. This subject focus on interaction between scientific discovery, applications and challenge impact in biotechnology. There are four focus field includes industrial microbiology, agricultural, healthcare, biomaterial, enzyme and bioinformatics potential process 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 enzymes 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 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 in the application 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 session.

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 also will be 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 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 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 I 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 the 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 emphases 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 experiment 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 instrument. In extraction parts, students will be exposed on extraction methods of nucleic acids, proteins and metabolic compounds. While in bioseparation parts, 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, 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. 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 instrument. 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 experiment 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

BACHELOR OF APPLIED SCIENCE MATERIAL TECHNOLOGY WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF APPLIED SCIENCE IN MATERIAL TECHNOLOGY WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEM	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 Advance 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	
	BCS1023 Programming Technique	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		
		UHS1011 Soft Skills I	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		
			UQB 1**1 Co-Curriculum 1	UHS 2011 Soft Skills II	UQ* 2**1 Co-Curriculum 2			
TOTAL CREDIT	**16**	**17**	**18**	**19**	**16**	**17**	**13**	**12**
TOTAL CREDIT FOR GRADUATION	**128**							

The information provided by Faculty of Industrial Sciences and Technology are based on University's Regulation and Endorsement until 26 July 2021

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 modeling	3
9	BSP4543	Semiconductor devices	3
10	BSP4553	Computational physics	3
11	BSP4563	Nanomaterial technology	3
Total minimum credits of elective courses for graduation ***Students are compulsory to take FOUR (4) elective courses during the study**			**12**

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO1 : 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.

PEO2 : Communicate effectively in leading and engaging multidisciplinary teams while solving materials-related problems locally and globally.

PEO3 : Advance their knowledge and skills for the advancement of related fields and explore business opportunities in the materials science technology Industries locally and globally.

PEO4 **:** Integrate ethical and professional values in managing and providing services to the recipients and provider of the materials science technology industries locally and globally.

PROGRAMME OUTCOMES (PO)

PLO1 : Demonstrate and apply comprehensive knowledge on material science and technology.

PLO2 : Safely synthesize materials and operate a range of advanced machineries and laboratory instruments.

PLO3 : Identify problems and formulate creative and innovative solutions.

PLO4 : Communicate efficiently orally and in writing with learning communities and the public.

PLO5 : Effectively engage in a multi-disciplinary team.

PLO6 : Practice empathy, responsibilities, integrity, and professionalism in their endeavours.

PLO7 : Manage information and engage in life-long learning.

PLO8 : Apply managerial and entrepreneurial skills.

PLO9 : Demonstrate leadership characteristics.

COURSE SYNOPSIS

COURSE SYNOPSIS FOR BACHELOR OF APPLIED SCIENCE IN MATERIAL TECHNOLOGY WITH HONOURS

BSP1153
Mechanics & 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 & 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) 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) 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 theological 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) 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) 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, calendering 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 leaners. 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) 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) 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) 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

BACHELOR OF OCCUPATIONAL SAFETY AND HEALTH WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF OCCUPATIONAL SAFETY AND HEALTH WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	**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 Falsafah 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-curiculum 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		Elective 3		
	BPS1123 Analytical Chemistry	BPS1232 Introduction to Microbiology		BPS2163 Ethics and Leadership in Safety	BPS3133 Construction Safety			
	BPS1133 Analytical Instrumention	BPS1143 Hazard Recognition and Risk Management						
TOTAL CREDIT PER SEMESTER	**18**	**17**	**16**	**19**	**17**	**14**	**13**	**12**
TOTAL CREDIT FOR GRADUATION	**129**							

The information provided by Faculty of Industrial Sciences and Technology are based on University's Regulation and Endorsement until 27 July 2021

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)

PLO1 : Describe, interpret and apply knowledge of science and engineering in occupational safety and health

PLO2 : Assess and analyze issues of occupational safety and health in workplace and community

PLO3 : Interpret, analyze, synthesis and recommend preventive and corrective measures in occupational safety and health

PLO4 : Interpret, analyze, synthesis and recommend preventive and corrective measures in occupational safety and health

PLO5 : Apply evidence based scientific principles in discussing ideas of improvement in occupational safety and health

PLO6 : Educate and train employees, employers and the community on occupational safety and health

PLO7 : Demonstrate sensitivities and responsibilities towards the community, culture, religion and environment

PLO8 : Adhere to the legal, ethical principles and the professional code of conduct in occupational safety and health

PLO9 : Communicate in verbal and written forms with workers, other safety and health professionals, stakeholders and the community at large

PLO10 : Demonstrate leadership, interpersonal and social skills

PLO11 : Collaborate with other skills professionals

PLO12 : Conduct research related to occupational safety and health under supervision

PLO13 : Utilize ICT and information management system to enhance their occupational safety and health practices

PLO14 : Apply skills and principles of lifelong learning in career development

PLO15 : 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, professionals 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 exists 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 ant 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.

اونيۏرسيتي مليسيا ڤهڠ
UNIVERSITI MALAYSIA PAHANG

FACULTY OF MANUFACTURING AND MECHATRONIC ENGINEERING TECHNOLOGY

UNDERGRADUATE PROSPECTUS 2021/2022

B.ENG (HONS.) MANUFACTURING ENGINEERING

CONTENTS

CURRICULUM STRUCTURE

B. ENG (HONS.) MANUFACTURING ENGINEERING (BFF)

YEAR	FIRST	SECOND	THIRD		FOURTH
SEMESTER	FIRST & SECOND	FIRST & SECOND	FIRST & SECOND		FIRST & SECOND
	BFF1103 Statics	BFF2801 Electrical/Electronics Lab	BFF3103 Vibrations		BFF4902 Final Year Project 1
	BFF1801 Machining 1	BFF1123 Dynamics	BFF3622 Computer Aided Manufacturing		BFF4**3A Manufacturing Elective 3
	BFF2003 Computer Programming	BFF1133 Mechanics Of Materials	BFF3242 Heat Transfer		BFF4914 Final Year Project 2
	BFF1113 Engineering Materials	BFF2612 Computer Aided Engineering Design	BFF3632 Design of Jigs & Fixtures		BFF4**3B Manufacturing Elective 4
	BFF1602 Technical Drawing	BFF2423 Manufacturing Processes	BFF3**3A Manufacturing Elective 1	BFF3906 INDUSTRIAL TRAINING (LI) 12 WEEKS	BFF3123 Machine Design
MANUFAC TURING ENGINEER ING CORE COURSES	BFF1811 Machining 2	BFF2223 Fluid Mechanics	BFF2821 Mechanics Lab		BFF4103 Control System Engineering
	BFF1502 Project Management	BFF2233 Thermodynamics	BFF2433 Advanced Manufacturing Processes		BFF4911 Environment Safety & Health
	BFF1343 Fundamental Of Electrical Engineering	BFF2523 Quality Engineering	BFF3**3B Manufacturing Elective 2		BFF4533 Manufacturing Automation
	BFF1353 Fundamental of Electronics Engineering	BFF2513 Manufacturing System	BFF3313 Sensor and Instrumentation Systems		BFF3523 Production Planning and Control
	BFF1932 Engineers in Society	BFF1922 Engineering Economy	BFF3801 Thermal-Fluid Engineering Lab		
			BFF3573 Product Design and Development		
			BFF4653 Integrated Design Project		
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				

The information provided by Faculty of Manufacturing & Mechatronic Engineering Technology are based on University's Regulation and endorsement until 15 Mac 2019

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
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 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)

PROGRAMME LEARNING 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

COURSE SYNOPSIS FOR DEGREE PROGRAMME 2021/2022

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. quilibrium 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 microelectromechanical devices and systems and nanoscale manufacturing.

CO1: Comprehend knowledge in advanced manufacturing processes.
CO2: Analyze engineering problems related to advanced 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 photopolymerization, 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 is 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.

B.ENG (HONS.) MECHATRONICS ENGINEERING

CONTENTS

- CURRICULUM STRUCTURE
- PROGRAMME EDUCATIONAL OBJECTIVE (PEO)
- PROGRAMME OUTCOMES (PO)
- COURSE SYNOPSIS

CURRICULUM STRUCTURE

B. ENG (HONS.) MECHATRONICS ENGINEERING (BFM)

YEAR	FIRST	SECOND	THIRD		FOURTH
SEMESTER	FIRST & SECOND	FIRST & SECOND	FIRST & SECOND		FIRST & SECOND
MECHATRONICS ENGINEERING CORE COURSES	BFF1103 Statics	BFF3622 Computer Aided Manufacturing	BFF3103 Vibrations	BFF3906 INDUSTRIAL TRAINING (LI) 12 WEEKS	BFF4902 Final Year Project 1
	BFF1801 Machining 1	BFF1123 Dynamics	BFF1922 Engineering Economy		BFM3**3A Mechatronics Elective 1
	BFF2003 Computer Programming	BFF1133 Mechanics of Materials	BFF3242 Heat Transfer		BFF4914 Final Year Project 2
	BFF1113 Engineering Materials	BFF2612 Computer Aided Engineering Design	BFM3303 Electrical Drive System		BFF3123 Machine Design
	BFF1602 Technical Drawing	BFF2423 Manufacturing Processes	BFM2013 Programming for Engineers		BFF4103 Control System Engineering
	BFF1811 Machining 2	BFF2223 Fluid Mechanics	BFF2821 Mechanics Lab		BFF4911 Environment Safety & Health
	BFF1502 Project Management	BFF2233 Thermodynamics	BFM3002 Computer Simulation		BFM4503 Robotics for Engineers
	BFF1343 Fundamental of Electrical Engineering	BFM2303 Analog Electronics	BFM3403 Fluid Drive System		BFF3313 Sensor and Instrumentation Systems
	BFF1932 Engineers in Society	BFM2313 Digital Electronics	BFM3333 Microcontroller System		BFM3**3B Mechatronics Elective 2
		BFF2831 Fundamental of Electrical Engineering Lab	BFF3801 Thermal-Fluid Engineering Lab		BFF4**3C Mechatronics Elective 3
			BFF3573 Product Design and Development		
			BFF4653 Integrated Design Project		
109	20	26	29	6	28
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 Skills 1, Soft Skill 2, Co-Curriculum I, Co-Curriculum II, Technopreneurship, Elective Courses PBMSK				
138	Total Credit for Graduation				

ELECTIVE COURSES FOR
B. ENG (HONS.) MECHATRONICS ENGINEERING

NO.	CODE	COURSE	CREDIT HOUR	FIELD
1	BFM3323	Power Electronics	3	Electrical & Electronics
2	BFM3313	Electrical Power and Machines	3	Electrical & Electronics
3	BFM3003	Artificial Intelligence System	3	Software
4	BFM4603	Control System 2	3	Computer & Control
5	BFM4613	Digital Signal Processing	3	Computer & Control
6	BFM4513	Automation System	3	Mechanics & Automation
7	BFM4313	Industrial Electronics	3	Electrical & Electronics
8	BFM4323	Digital System In Mechatronics Design	3	Electrical & Electronics
9	BFM4523	Autonomous Robotic System	3	Mechanics & Automation
10	BFM4533	Robotic Prototype Design	3	Mechanics & Automation
11	BFM4013	Computer Network In Mechatronics System	3	Software
12	BFM4633	Data Analytics	3	Software
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)

PROGRAMME LEARNING 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

COURSE SYNOPSIS FOR DEGREE PROGRAMME 2021/2022

COURSE SYNOPSIS FOR MECHATRONICS PROGRAMME (BFM)

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.

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.

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

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 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.

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 analyze 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.

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

BFM2831 Fundamental of Electrical Engineering Lab
Credit Hours: 1
Prerequisite: BFF1343

Synopsis

This course introduces practical electrical circuits. Students should analyze, synthesis, and build circuits using passive or active components.

CO1: Apply electrical fundamental techniques to solve circuits using modern tools.
CO2: Implement fundamental electrical and electronics principle devices to solve circuit problems.
CO3: Develop an integration of electrical systems for an application in a group.

BFF4911 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 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.

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 prepares 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.

BFM2013 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.

BFF2612 Computer Aided Engineering Design
Credit Hours: 2
Prerequisite: BFF1602

Synopsis

This course introduces 3D surface solid modelling which emphasized on 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 modeling 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

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. This course introduces the basic technique to perform manual production techniques by selecting and using appropriate hand tools and performing basic turning processes and operations according to the given dimensions, specifications and tolerances.

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

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 organized 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.

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

BFF3622 Computer Aided Manufacturing
Credit Hours: 2
Prerequisite: BFF2612

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. 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

BFF2821 Mechanics Lab
Credit Hours: 1

Prerequisite: BFF1133, 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

BFF2223 Fluid Mechanics
Credit Hours: 3
Prerequisite: None

Synopsis

This course is a fundamental subject 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 also be 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: Analyze forces applied by fluids at rest.
CO2: Analyze mass, Bernoulli and energy equations associated with fluids in motion.
CO3: Analyze minor and major losses, pressure drop and pumping power requirement of laminar and turbulent flow in pipes.
CO4: Analyze 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.

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 thermofluids 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

BFF1133 Mechanics of Materials
Credit Hours: 3
Prerequisite: BFF1102, 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: Analyze the stress and strain in structural members subjected to the axial loads and torsional loads.
CO3: Analyze the stress and strain in structural members subjected to the bending loads and shear loads.
CO4: Analyze the stress and strain in structural members subjected to the combined load and analyze the stress transformation to solve the mechanics of materials problems.
CO5: Design solutions for complex engineering problem related to mechanics of materials

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.

BFF3313 Sensor and Instrumentations
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.

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: Analyze the cost concept, cost structure and estimation
CO2: Analyze the money-time relationship with/without taxes consideration
CO3: Justify the best economical alternative in private and public engineering projects

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 thermofluids problems at conceptual design stage. The course covers three major chapters in thermofluid 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.

BFF1932 Engineers 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.

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

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 utilized. 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

BFM2313 Digital Electronics
Credit Hours: 3
Prerequisite: BFF1343

Synopsis

This course is designed to introduce the basic principle of digital systems and digital circuit design with analysis. Lecture and practical will cover the following: Algebra Boolean, Numbering system, Basic Logic Gate, Combinational Logic Circuit Design, Bi-stable Memory Devices and Sequential Circuits Design.

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: Construct digital schematic using computer aided design tools

BFM2303 Analog Electronics
Credit Hours: 3
Prerequisite: BFF1343

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
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

BFM3002 Computer Simulation
Credit Hours: 3
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
CO2: Construct functional programs using scripts
CO3: Design block diagrams using Simulink toolboxes
CO4: Develop simulation solution/project for dynamic Mechatronics systems in Simulink/MATLAB

BFM3333 Microcontroller System
Credit Hours: 3
Prerequisite: BFF1343

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.

CO1: Demonstrate microcontroller's internal working and its architecture: Processing Unit, Registers, Memory, and their data flow.
CO2: Analyze microcontroller peripherals: Digital and Analog I/O, Timer, PWM, ADC
CO3: Analyze microcontroller subsystem: interrupt, serial communication, Master-Slave.
CO4: Develop a solution for engineering problems using microcontrollers.
CO5: Communicate effectively in group works, presentations, and reports.

BFM3403 Fluid Drive System
Credit Hours: 3
Prerequisite: BFF1343

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 Fundamentals of Fluid Power; Pneumatic system; Hydraulic system and Programmable Logic Controller. Laboratory management and 5S implementation is essential for the lab session.

CO1: Apply Pneumatic and Hydraulic system and its components
CO2: Analyse PLC program for automation system
CO3: Design hydraulic/pneumatic system for mechatronics applications
CO4: Demonstrate the understanding of Engineering principles in managing the project

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

BFM3303 Electrical Drive System
Credit Hours: 3
Prerequisite: BFF1343

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.

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.

BFM4503 Robotics for Engineers
Credit Hours: 3
Prerequisite: None

Synopsis

This course provides an overview of robot mechanisms, 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, students shall design the robot, together with the complete mathematical modelling to implement the theories that have been learnt.

CO1: Derive the robot kinematics using spatial movement.
CO2: Develop robot dynamic using Lagrange-Euler formulation and robot trajectory planning
CO3: Develop the robot's control system using PID Controller
CO4: Design a robotics system project in simulation and experiment
CO5: Communicate about the project effectively

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 detailed manufacturing process planning including materials selection, tooling and process parameters.
CO5: Produce the product according to the proposed plan which is 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 books and conducting 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

BFM4902 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 practice
CO6: Demonstrate project management principles according to engineering practice
CO7: Conduct preliminary investigation based on the proposed research methodology.

BFM4914 Final Year Project 2
Credit Hours: 4
Prerequisite: BFM4902 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 investigations 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.

BFM4513 Automation System
Credit Hours: 3
Prerequisite: None

Synopsis

This course introduces the students to various control systems for operating equipment such as machinery, processes in factories, boilers and heat treating ovens, switching on telephone networks, steering and stabilization of ships, aircraft and other applications and vehicles with minimal or reduced human intervention. Automation has been achieved by various means including mechanical, hydraulic, pneumatic, electrical, electronic devices and computers, usually in combination After completing this course, students should be able to apply the theory of automation in mechatronics systems.

CO1: Demonstrate understanding of specific application and function related to automation
CO2: Analyse automation of the mechatronics systems in the industrial applications
CO3: Design an integration of automation devices and computerization of the mechatronics support systems
CO4: Develop a solution for an automation problem

BFM4513 Elective: Autonomous Robotic System
Credit Hours: 3
Prerequisite: 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 the theory into the real autonomous systems.

CO1: Demonstrate understanding of the overall robotic system (close loop system, hardware software integration)
CO2: Analyse the motion kinematic of holonomic and non-holonomic system
CO3: Analyse path planning Methodology using A* algorithm
CO4: Develop trajectory tracking control system algorithm for an autonomous system

BFM4543 Robotic Prototype Design
Credit Hours: 3

Prerequisite: None

Synopsis

This course will expose the student to the engineering design of mechanism and control of prototype biomimetic robotic systems, which takes inspiration from nature to solve engineering problems. Students will learn the fundamentals of biomimetic mechanisms such as legged locomotion, bird flight, swimming, and also biomimetic artificial muscles. For biomimetic control, students will learn about dynamics and control of bipedal walking, aerial flight and biomimetic underwater propulsion. Students are required to design a prototype robotic system, compare their design strengths and weaknesses with their teammates, and then propose the best design for solving a set problem.

CO1: Analyse the solution requirements for a problem
CO2: Design a biomimetic mechanical system that fulfils a set specification
CO3: Evaluate the strength and weakness of a design from a cost, weight, durability and practicality standpoint
CO4: Propose an improvement design after discussion with team members

BFM4603 Elective: Control System 2
Credit Hours: 3
Prerequisite: None

Synopsis

This course extends the contents of available Control System subjects in the Mechatronic Programme. It introduces the state space analysis: (Concepts of State, State variable and State space model) controllability and observability: (BIBO Stability – Determining the stability by - Liapunov's stability criterion), nonlinear control: (Nonlinear systems properties, common physical non-linearity's, dead zone, relay, saturation)

CO1: Study the basics of the State space control method.
CO2: Analyze the controllability and observability of the control system.
CO3: Analyze and control the nonlinear dynamics system
CO4: Develop a non-linear control system with state space control method.

BFM4613 Elective: Digital Signal Processing
Credit Hours: 3
Prerequisite: None

Synopsis

This course introduces Digital Signal Processing and its applications. Discrete time signals and systems. Z-transform. Modelling and implementation forms of DT systems. Time and Frequency domain analysis of digital processors. Design and analysis of finite impulse response filters (FIR). Analog filter approximations. Design and analysis of infinite impulse response (IIR) filters. Digital filter networks. Digital equalizers. The Digital Fourier Transformation and Fast Fourier Transformation algorithms. DSP algorithms and applications.

CO1: Demonstrate the basic knowledge of DSP systems.
CO2: Design of DSP system.
CO3: Analyze DSP system with FIR, IIR, DFT, FFT algorithms
CO4: Develop DSP applications using computer software.

BFM4623 Elective: Computer Network in Mechatronic System
Credit Hours: 3
Prerequisite: None

Synopsis

This course introduces Computer Network in mechatronics system, layers of Transport and dialogue sessions - examples of the presentation layer in applications of mechatronics system - network security and privacy – Text compression - terminal protocol - File Transfer Protocol - the application layer - Distributed Computing - network systems and distributed operating in mechatronics system application.

CO1: Introduce the basics of computer networks.
CO2: Design a network layer with security and protocol implementation.
CO3: Develop a complete network system for mechatronics applications.

BFM4633 Elective: Database and Information System
Credit Hours: 3

Prerequisite: None

Synopsis

Nowadays, a tremendous amount of data is being generated, gathered and collected throughout multiple sources around us. Big data term was born a few years back to describe data sets that are so large or complex that traditional data processing application software is inadequate to deal with them. By having this massive data, many challenges will occur including capture, storage, analysis, data curation, search, sharing, transfer, visualization, querying, updating, and information privacy as well. This course will provide an introduction to big data management and analysis. In addition, the beginner level of database setup and handling as well as parallel computing techniques are also introduced to fit the purpose. By the end of semester, the students apply the knowledge to solve real world big data problems.

CO1: Apply and identify the concepts of architectural components and programming models used for scalable big data management and analysis as well as how big data is analyzed.
CO2: Properly construct and build clouds to be executed under a high performance computing environment.
CO3: Analyze real world big data problems using specific architectural components and programming models.
CO4: Orally present and collaborate effectively in a group on the real world big data problems project.

BFM4313 Elective: Industrial Electronics
Credit Hours: 3
Prerequisite: None

Synopsis

This course introduces some industrial Electronics components that hasn't been covered in the previous electronics courses: sample and hold circuit, Digital to Analog Converter, Analog to Digital Converters, Circuit Breaker, Electrical Switches, Relays, Thyristors, Triac, Photo-cells, Voltage and current regulators, flip/ flop etc.

CO1: Demonstrate the working principle of some industrial electronics parts.
CO2: Integrate the studied components with other electronics components.
CO3: Develop applications using these components.

BFM4723
Elective: Digital System in Mechatronics Design
Credit Hours: 3
Prerequisite: None

Synopsis

This course introduces the students to the foundation of the digital system. The course will start with the introduction of the understanding of control unit (CU) and data path unit (DU) for a control system. The core of this course will address the development concept of controlling mechatronics systems. The course will be accompanied by a 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 the theory into the real mechatronics systems.

CO1: Demonstrate understanding of the overall digital system (control unit (CU), data path unit (DU), CU-DU integration)
CO2: Design control unit using Finite State Machine
CO3: Design integration of control unit and data path resources using Register Transfer Level (RTL)
CO4: Develop a digital system for a mechatronics system using FPGA.

B.ENG (HONS.) MECHATRONICS ENGINEERING (COLLABORATION PROGRAMME WITH HsKA, GERMANY)

CONTENTS

CURRICULUM STRUCTURE

B.ENG (HONS.) MECHATRONICS ENGINEERING (COLLABORATION PROGRAMME WITH HSKA, GERMANY) BHM

YEAR	FIRST	SHORT SEM 1	SECOND	SHORT SEM 2	THIRD	FOURTH		FIFTH
SEMESTER	FIRST & SECOND		FIRST & SECOND		FIRST & SECOND	FIRST	SECOND	FIRST
MECHATRONICS ENGINEERING CORE COURSES (DUAL DEGREE)	BHM1103 Statics	UHG1016 Intensive German 1 (Compulsory)	BHM2323 Electronics Engineering 2	UHG2016 Intensive German 2 (Optional)	BHM2313 Microcomputer Technology	BHM3912 Internship BHM3931 Internship Follow-up	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		BHMXXX3 Focus Module 2(a)	
	BHM2003 Computer Programming		BHM2212 Thermal-Fluid Engineering		BHM3012 Numerical Programming		BHMXXX3 Focus Module 2(b)	
			BHM3013 Software Engineering		BHM3922 Internship Preparation			
			BHM2403 Manufacturing Processes		BHM4103 Control Systems Engineering			
					BHM4102 Finite Element Analysis			
					BHM3321 Design Exercise			
					BHM3332 Sensor and Instrumentation Systems			
					BHMXXX3 Focus Module 1(a)			
					BHMXXX3 Focus Module 1(b)			
					BHM4921 Engineers & Society			
					BHM3942 Engineering Communication			
					BHM4911 Environment Safety & Health			

The information provided by Faculty of Manufacturing & Mechatronics Engineering Technology are based on University's Regulation and endorsement until 15 Mac 2019

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 1, German 2, Intensive German 1 (Compulsory), German 3 (optional), German 4 (optional), Intensive German 2 (Optional)							
146	Total Credit for Graduation 146							

ELECTIVE COURSES FOR
B.ENG (HONS.) MECHATRONICS ENGINEERING (UMP-HsKA) PROGRAMME (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)

PROGRAMME LEARNING 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

COURSE SYNOPSIS FOR DEGREE PROGRAMME 2021/2022

COURSE SYNOPSIS FOR MECHATRONICS (UMP-HsKA) PROGRAMME (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 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 project 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 modelling 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 vs 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 gases 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 HsKA 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 built 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 fulfil the requirement from the industry that relies on the microtechnologies application.

CO1: Apply the microtechnology and energy harvesting autonomous knowledge
CO2: Implementing the micro energy harvesting system.
CO3: Analyse the working principle of the microtechnology 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 emphasisation 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 modelling 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 Lagrance 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 obob 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

BACHELOR OF ENGINEERING TECHNOLOGY (MANUFACTURING) WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF ENGINEERING TECHNOLOGY (MANUFACTURING) WITH HONS.

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	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	BTV3413 Industrial Quality Control	BTM3713 Lean Manufacturing System	BTM3514 Computer Integrated Manufacturing	BTM4783 Elective 1	
	BUM1113 Technical Mathematics	BT12413 Properties of Materials	BTM2233 Thermofluid	BTV3433 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 Penghayatan Etika Dan Peradaban						
		UHF2041 Foreign Language 2						
	19	20	18	17	19	18	19	12
142	OVERALL TOTAL CREDIT FOR GRADUATION							

The information provided by Faculty of Manufacturing & Mechatronics Engineering Technology are based on University’s Regulation and endorsement until 15 Mac 2019

ELECTIVE COURSES FOR
BACHELOR OF ENGINEERING TECHNOLOGY (MANUFACTURING) WITH HONS.

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)

PROGRAMME LEARNING 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

COURSE SYNOPSIS FOR DEGREE PROGRAMME 2021/2022

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, 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.

<u>ELECTIVE COURSES</u>

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.

BACHELOR OF TECHNOLOGY IN INDUSTRIAL MACHINING WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF TECHNOLOGY INDUSTRIAL MACHINING WITH HONS.

YEAR	FIRST		SECOND		THIRD			FOURTH
SEMESTER	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	SHORT	FIRST
PROGRAMME COURSES	**BVM1013** Product Drafting and Specification	**BVM1054** Tool Setup and Refurbishment	**BVM2094** Precision and Finishing in CNC Technology	**BVM2013** Precision and Finishing in EDM And Grinding Technology	**BVM3214** Rework and Rehabilitation Of Machined Component	**BVM3254** Acts and Risk Assessment in Machining Production	**BVM4026** Final Year Project 2	**BVM3212** Industrial Training
	BVM1023 Standard Product Precision	**BVM1063** Sustainable Machining	**BVM2114** Prismatic CADCAM Product	**BVM2134** Complex CADCAM Product	**BVM3224** Surface Aesthetics of Machined Component	**BVM3244** Project Management and Supervision		
	BVM1033 Workpiece and Cutting Tool Properties	**BVM1073** Condition Monitoring in Machining	**BVM2123** Multi Axis Machining	**BVM2124** Capstone Technopreneurship 1	**BVM3124** Capstone Technopreneurship 2	**BVM3234** Machine Maintenance		
	BVM1043 Jig and Fixture	**BVM1083** Assessment of Machinability	**BVM3154** Assembly Method	**BVM2143** Heat Treatment of Machined Component	**BVM33*4** Elective 1A	**BVM4014** Final Year Project 1		
UNIVERSITY COURSES	**UGE2002** Technopreneurship	**UHL2442** Essential English	**UHL2452** English For Vocational Communications	**UHC2022** Penghayatan Etika Dan Peradaban				
	UHC1012 Falsafah Dan Isu Semasa	**UHF11*1** Mandarin For Beginner	**UHF21*1** Mandarin For Intermediate	**UHS1022** Soft-Skills				
	UQB1** Co-Curriculum 1	**UQ*2**1** Co-Curriculum 2						
TOTAL CREDIT	17	17	18	18	16	16	6	12
TOTAL CREDIT FOR GRADUATION	120							

ELECTIVE COURSES FOR
BACHELOR OF TECHNOLOGY INDUSTRIAL MACHINING WITH HONS.

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 OUTCOMES (PO)

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

COURSE SYNOPSIS FOR DEGREE PROGRAMME 2021/2022

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.

BACHELOR OF TECHNOLOGY IN WELDING WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF TECHNOLOGY IN WELDING WITH HONS.

YEAR	FIRST		SECOND		THIRD			FOURTH
SEMESTER	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	SHORT	FIRST
BACHELOR OF TECHNOLOGY WELDING WITH HONS. COURSES	BVW1014 Safety in Welding	BVW1043 Product Design in Welding	BVW2074 Imperfection in Welding and Testing	BVW2154 Capstone Technopreneurship 1	BVW3154 Capstone Technopreneurship 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 Reclaimination 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		
	UQB**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 HONS.

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 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)

PROGRAMME LEARNING OUTCOMES (PLO)	
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

COURSE SYNOPSIS FOR DEGREE PROGRAMME 2021/2022

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 join; 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 labour.
CO3: Record of transactions in journal and ledgers, trial-balance and preparation of final account. use

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 Reclaimination 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.

BVW3214 Managing Production / 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.

BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (INDUSTRIAL AUTOMATION) WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (INDUSTRIAL AUTOMATION) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (INDUSTRIAL AUTOMATION) COURSES	BTI1112 Engineering Materials	BTI1323 Thermodynamics	BTI2223 Strength of Materials	BTI2121 Materials Lab	BTI3523 Sensor and Instrumentation Systems	BTI3623 Capstone	BTI4710 Final Year Project	BTI4812 Industrial Training
	BTI1212 Statics	BTI1523 Electrical and Electronics	BTI2412 Computer Aided Engineering and Manufacturing	BTI2123 Project Management Eng. Economy	BTI3603 Control Systems Engineering	BTI3403 Introduction to Machine Learning	BTI4122 Professional Practice & Ethics	
	BTI1413 Computer Aided Design	BTI1122 Industrial Quality Control	BTI2213 Dynamics	BTI2622 Microcontroller	BTI1423 Programming for Eng. Technologists	BTI3822 Internship Preparation	BTI4113 Occupational Safety and Health	
	BTI1133 Manufacturing Processes	BTI1423 Programming	BTI2313 Fluid Mechanics	BTI3513 Digital Electronics	BTX3612 Industrial IoT	BTI3503 Electrical Drive System	BTI3122 Fundamental of IR4.0	
	UQB**1 Co-Curriculum 1	BUM1223 Calculus	BUM2113 Applied Mathematics	BTX2643 Robotic System Modelling	BTI2623 Industrial Automation	BT* 3**3 Elective 3		
	UHL2400 Fundamentals of English Language	UHF1111 Foreign Language 1	UGE2002 Technopreneurship	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							
	18	18	17	19	19	19	17	14
140	OVERALL TOTAL CREDIT FOR GRADUATION							

ELECTIVE COURSES FOR
BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY
(INDUSTRIAL AUTOMATION) WITH HONS.

NO.	CODE	COURSE	CREDIT HOUR
1	BTX3523	Autonomous Robotic System	3
2	BTI3413	Applied Machine Learning	3
3	BTI3723	Automated Manufacturing Systems	3
4	BTI3423	Machine Vision	3
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 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)

PROGRAMME LEARNING 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

COURSE SYNOPSIS FOR DEGREE PROGRAMME 2021/2022

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 equilbrium 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. 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, Lagrance-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

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 is 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

BTI3723 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 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 system.
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.

UNDERGRADUATE PROSPECUS 2021/2022

BACHELOR OF MECHATRONIC ENGINEERING TECHNOLOGY (ROBOTICS) WITH HONOURS

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CURRICULUM STRUCTURE

BACHELOR OF MECHATRONIC ENGINEERING TECHNOLOGY (ROBOTICS) WITH HONS.

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEMESTER	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
BACHELOR OF MECHATRONIC ENGINEERING TECHNOLOGY (ROBOTICS) COURSES	BTI1523 Electrical and Electronics	BTX1523 Analog Electronics	BTI3513 Digital Electronics	BTX2143 Rapid Prototyping and Manufacturing	BTI3403 Introduction to Machine Learning	BTI3623 Capstone	BTI4710 Final Year Project	BTI4812 Industrial Training
	BTI1212 Statics	BTI1133 Manufacturing Processes	BTI2412 Computer Aided Engineering and Manufacturing	BTI2123 Project Management Eng. Economy	BTI3603 Control Systems Engineering	BTI3523 Sensor and Instrumentation Systems	BTI4122 Professional Practice & Ethics	
	BTI1413 Computer Aided Design	BTX1222 Mechanics of Materials	BTI2213 Dynamics	BTI2622 Microcontroller	BTI3503 Electrical Drive System	BTI3822 Internship Preparation	BTI4113 Occupational Safety and Health	
	BTI1423 Programming		BTX2433 Computer Simulation	BTX2013 Software Development	BTX3612 Industrial IoT	BTX3463 Artificial Intelligence	BTI3122 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 Technopreneurship		UHC2022 Penghayatan Etika dan Peradaban
	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							

The information provided by Faculty of Manufacturing & Mechatronic Engineering Technology are based on University's Regulation and endorsement until 15 Mac 2019

ELECTIVE COURSES FOR
BACHELOR OF MECHATRONIC ENGINEERING TECHNOLOGY (ROBOTICS) WITH HONS.

NO.	CODE	COURSE	CREDIT HOUR
1	BTX3523	Autonomous Robotic System	3
2	BTI3413	Applied Machine Learning	3
3	BTI3723	Automated Manufacturing Systems	3
4	BTI3423	Machine Vision	3
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 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)

PROGRAMME LEARNING 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

COURSE SYNOPSIS FOR DEGREE PROGRAMME 2021/2022

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
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 multism 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, 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, Lagrance-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 is 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 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 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

BTI3723 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 system.
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.

UNIVERSITI MALAYSIA PAHANG

FACULTY OF MECHANICAL AND AUTOMOTIVE ENGINEERING TECHNOLOGY

UNDERGRADUATE PROSPECTUS 2021/2022

B.ENG (HONS.) AUTOMOTIVE ENGINEERING (COLLABORATION PROGRAMME WITH HsKA, GERMANY)

CONTENTS

CURRICULUM STRUCTURE

B.Eng (Hons.) Automotive Engineering (Collaboration Programme with HsKA, Germany)

YEAR	FIRST			SECOND			THIRD		FOURTH		FIFTH
SEM	**FIRST**	**SECOND**	**THIRD**	**FIRST**	**SECOND**	**THIRD**	**FIRST**	**SECOND**	**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 Mechnical Vibrations	BHA4224 Automotive Engineering		BHA4704 Team Oriented Project Study	BHA4904 Bachelor Thesis
	BHA1801 Experimental Laboratory	BHA1421 Mechanical Laboratory		BUM2413 Applied Statistics	BHA2021 Occupational Safety & Health		BHA3602 Automotive Product Development	BHA3533 Thermodynamics and Heat Transfer		BHA4611 Introduction to Autonomous Driving	BHA4931 Final Examination (Viva)
	BUM2123 Applied Calculus	BUM2133 Ordinary Differential Equations					BHA3921 Engineers and Society	BHA3302 Sensors		BHA4311 Actuators 2 ECTS	
	BHA1021 Technical Communication						BHA3012 Numerical Programming	BHA4**21 Specialisation 1		BHA4**23 Specialisation 3	
					UGE2002 Technopreneurship		BHA3922 Internship Preparation	BHA4**22 Specialisation 2		BHA4**24 Specialisation 4	
	UHC1012 Falsafah dan Isu Semasa	UQB***2 Co-Curriculum 1		UHS1012 Soft Skills	UHC2022 Penghayatan Etika dan Peradaban		BHA4022 Project Management				
	UHG1003 German 1	UHG1013 German 2	UHG1016 Intensive German I	*UHG2003 German 3	*UHG2013 German 4	*UHG2016 Intensive German 2					
TOTAL CREDIT	**18**	**17**	**6**	**13 (*16)**	**13 (*16)**	***6**	**18**	**18**	**13**	**14**	**10**
TOTAL CREDIT FOR GRADUATION	**140**										

***Optional**

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
Total Minimum Credit of Specialisation Subjects for Graduation			**8**

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

Program (PEO) of BHA

PEO 1: Graduates are competent, responsible and practice professionalism in the global context.

PEO 2: 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 analyse 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 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. [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

CURRICULUM STRUCTURE FOR DEGREE COLLABORATION PROGRAMME WITH HSKA (BHA) 2020/2021

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 communique 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 becapable 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.

BACHELOR OF TECHNOLOGY IN AUTOMOTIVE WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF TECHNOLOGY IN AUTOMOTIVE WITH HONOUR

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEM	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**
COURSES	UHL2442 Essential English	UHL2452 English for Vocational	UHL1111 Mandarin Language	UHF2111 Mandarin Language	UHF2111 Mandarin for Intermediate	BVA3043 Asset & Inventory Management	BVA3326 Final Year Project 2	BVA3412 Industrial Training
	UHC1012 Falsafah dan Isu Semasa	UHC2022 Penghayatan Etika dan Peradaban	BVA2013 Project Management	BVA2034 Powertrain System Service	BVA3024 Capstone Technopreneurship 2	BVA3073 Risk Management		
	UQB1**1 Co. Curriculum 1	UQB2**1 Co. Curriculum 2	BVA2024 Autotronic System Service	BVA2044 Capstone Technopreneurship1	BVA3032 Vehicle Marketing	BVA3056 Quality Management		
	UGE2022 Technopreneurship	UHS1022 Softskills	BVA2**41 Elective 1	BVA2**43 Elective 3	BVA3013 Automotive Legislation	BVA3314 Final Year Project 1		
	BVA1014 Automotive Industry & Technology	BVA1043 Shopfloor Supervision	BVA2**42 Elective 2	BVA2**44 Elective 4	BVA3**41 Elective 5			
	BVA1034 Automotive Workshop Practice	BVA1064 Automotive Component Fabriacation			BVA3**42 Elective 6			
	BVA1023 Automotive Drafting	BVA1054 Automotive Component Design & Assembly						
TOTAL CREDIT	**18**	**18**	**16**	**17**	**17**	**16**	**6**	**12**
TOTAL CREDIT FOR GRADUATION	**120**							

ELECTIVE COURSE TO BE OFFERED IN BACHELOR OF TECHNOLOGY IN AUTOMOTIVE WITH HONOURS

NO.	CODE	COURSE	CREDIT HOUR
DIAGNOSE SPECIALIST			
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
RETROFIT SPECIALIST			
1	BVA2134	Surface Design	4
2	BVA2144	Automotive Modeling	4
3	BVA2174	Exterior Design	4
4	BVA2184	Component Re-Manufacturing	4
5	BVA3134	Interior Design	4
6	BVA3144	Painting	4
Total Minimum Credit of Elective Subjects for Graduation			**24**

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	Knowledge Apply knowledge of technology fundamentals to broadly-defined procedures, processes, systems and methodologies in the field of automotive study
PO2	Practical Skills and High Technology Able to suggest and apply latest tools and techniques to solve broadly- defined problems
PO3	Analytical and Critical Thinking and Scientific Approach Demonstrate strong analytical and critical thinking skills to solve broadly- defined problems in the field of automotive study
PO4	Communication Skills Able to communicate and articulate effectively in both verbal and written among technologist communities and society at large.
PO5	Social and Responsibility in Society and Technologist Community Demonstrate understanding of the societal related issues and the consequent responsibilities relevant to broadly-defined technology practices.
PO6	Lifelong learning and information management Recognize the needs for professional development and to engage independent lifelong learning in specialist technologists.
PO7	Entrepreneurs and Management Skills Demonstrate an awareness of management and technopreneurship practices in real perspective.
PO8	Ethics and Professionalism Demonstrate professionalism and social and ethical consideration
PO9	Teamwork and Leadership Demonstrate leadership quality, mentoring and work effectively in diverse teams.

COURSE SYNOPSIS

CURRICULUM STRUCTURE FOR DEGREE TECHNOLOGY PROGRAMME 2020/2021

AUTOMOTIVE TECHNOLOGY

BVA1014
Automotive Industry & Technology
Credit Hour : 4
Prerequisite : None

Synopsis

This course is relevant to expose about knowledge about automotive industry and technology revolutions that happened in global. It is important to give knowledge about elements in automotive industrial revolutions, describe about additive manufacturing, figure aout about autonomous robots, supply chain, cloud computing, cyber security, internet of things, big data analytics, horizontal and vertical integration, and simulation and augmented reality.

Course Learning Outcomes

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

CLO1: to elaborate the smartness technology in automotive industry
CLO2: to adapt knowledge on various systems used and their role in automotive industrial world
CLO3: to classify the opportunities, challenges brought about by Industry and how organisations and individuals should prepare to reap the benefits

BVA1023
Automotive Drafting
Credit Hour : 3
Prerequisite : None

Synopsis

This course introduced method that is used to generate the 2D drawing which usually applied by industries. The suitable view and method in generating dimension on the selected view will be applied. It also introduced the geometric dimensioning and tolerancing together with manufacturing processes symbols in the drafting process which helps producing the correctly and efficiently in term of technical communication. Students will have a mini project to re-create the existing automotive component CAD data and propose the 2D drafting drawing in term of manufacturing aspect.

Course Learning Outcomes

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

CLO1: Apply knowledge and comprehension in generating 2D drafting for technical communication purpose (C3, P2, A2, PLO1)
CLO2: Analyze 2D view and generate 2D drafting with proper dimensions, tolerances and symbols (C4, P5, A3, PLO2)
CLO3: Reconstruct automotive components drafting and decide the proper dimensions, tolerances and symbols (C5, P6, A4, PLO4)

BVA1034
Automotive Workshop Practice
Credit Hour : 4
Prerequisite : None

Synopsis

This course aims to expose students to the operation of the general vehicle servicing internal combustion engine technology. the course also discuss how the service, repair, maintenance, design and test the performance of conventional internal combustion engines. in addition, students have to solve engineering problems in real time by leveraging their knowledge and learn new information to solve problems of related engines.

Course Learning Outcomes

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

CLO1: Classify the functions of major automotive engine subsystems.
CLO2: Inspect automotive engine assembly and diagnose engine malfunctions
CLO3: Demonstrate good working relation with team members.

BVA1043
Shopfloor Supervision
Credit Hour : 4
Prerequisite : None

Synopsis

Shop Floor Supervision is the system by which standards for running day-to-day business are established, maintained, controlled and improved. This approach is to continously improve daily operation to gain better achievement in safety, quality, cost, delivery and morale of the business operation, as well as for the workers. This contributes to waste elimination at all levels throughout the manufacturing system. This module reviews the skills and techniques required to analyze manufacturing system and to design improved methods and layouts. The focus of this module will be on the application of the technique through studies and industrial experience, and will identify the benefits to be gained by their success.

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: Display a good leadership and teamwork in shopfloor supervision (A5, PLO9)

BVA1054
Automotive Component Design & Assembly
Credit Hour : 4
Prerequisite : None

Synopsis

This course introduced method that is used to construct the 3D CAD data which usually applied in industrial field. The suitable features in constructing 3D CAD data will be applied which helps producing the correctly and efficiently 3D CAD data for technical communication purpose. Students will have a mini project to construct the 3D CAD data of automotive component which considering the related manufacturing process aspect.

Course Learning Outcomes

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

CLO1: Apply knowledge and comprehension in constructing 3D CAD data for technical communication purpose (C3, P3, A2, PLO1)
CLO2: Decide the proper features to use in constructing 3D CAD data based on the manufacturing process aspect (C5, P5, A3, PLO2)
CLO3: Construct 3D CAD data of automotive components and generate the complete assembly and exploded drawings (C5, P6, A4, PLO4)

BVA1064
Automotive Component Fabrication
Credit Hour : 4
Prerequisite : None

Synopsis

The automotive manufacturing processes play a major role in deciding on the vehicles' design characteristics and the overall cost. Thus it is important for technologist to identify suitable manufacturing process to fabricate automotive component. Technologist also should be able to pinpoint the manufacturing capabilities and limitations of each process in order to fabricate part according to the specified design tolerances.

Course Learning Outcomes

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

CLO1: Explain the fundamental concepts of manufacturing processes in automotive (P2, PLO1)
CLO2: Construct various skills of manufacturing techniques as an individual or a group. (P5, PLO2)
CLO3: Perform 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. Students will be familiarized with the Project Management process group functions (initiating, planning, executing, controlling and closing) and project knowledge areas (integration, scope, time, cost, quality, human resources, communications, risks and procurement). Various tools for supporting the analysis of works in engineering project management will be introduced. Topics including initiating and planning the project, working with the management, project appraisal & sensitivity, creating budget and work breakdown structure, managing uncertainty & risk, building project plan, implementing and revising project plan, completing the project and contract laws

Course Learning Outcomes

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

CLO1: Explain the core concepts and principles, functions, and process in project management (PLO1, C2)
CLO2: Manage a project from planning, preparing project proposal until closing out the project (PLO4, A4)
CLO3: Ability to function effectively as memebers or group leader in achieving project goal. (PLO9, A4)

BVA2024
Autotronic System Service
Credit Hour : 4
Prerequisite : None

Synopsis

This course focuses on theory, operation and application of automotive electrical and electronic systems. Topic covered includevehicle electrical wiring systems, sensors and actuators, charging system, ignition system, starting system, lighting system, chassis electrical system, auxiliary systems, mechatronics, automotive networking, bus systems.

Course Learning Outcomes

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

CLO1: Identify the components of the electrical and electronicsin automotive systems. (PLO1, C2)
CLO2: Explain the functions and operations of automotive electrical and electronic systems. (PLO3, C3)
CLO3: Construct of automotive electrical and electronic system. (PLO2, P4)

BVA2034
Powertrain System Service
Credit Hour : 4
Prerequisite : None

Synopsis

This subject focuses on powertrain services for light/heavy vehicle and engine repair management

Course Learning Outcomes

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

CLO1: Demonstrate vehicle service information, vehicle identification and routine maintenance (PL04,A3)
CLO2: Apply knowledge of comprehensive vehicle engine repair and assembly (PL02,P4)
CLO3: Apply knowledge of powertrain service management in real 3S Centre (PL07,A4)

BVA2044
Capstone Technopreneurship 1
Credit Hour : 4
Prerequisite : Technopreneurship

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.

Course Learning Outcomes

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

CLO1: Apply various financial indicators & tools to prepare for financial information for a new business venture (PLO7, C4, A4, P2 Knowledge)
CLO2: Acquire skills to analyze financial statements (PLO7, C2, A2, P5, Entrepreneurial Skills)
CLO3: Present financial information for new business (PLO7, C6, A2, P4, Practical Skills and High Technology)

CLO4: Display the art of negotiation with investors (PLO9, C2, A4, P5 Communication Skills)

BVA3024
Capstone Technopreneurship 2
Credit Hour : 4
Prerequisite : Technopreneurship Capstone 1

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 resourse 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 Learning Outcomes

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

CLO1: Apply the business model canvas incorporating human and financial elements (PLO7, C5, A4, P2 Knowledge)
CLO2: Acquire skills to resolve organizational conflicts (PLO8, C5, A2, P3 Critical Thinking and Problem Solving Skills)
CLO3: Write a convincing business plan (PLO7, C6, A2, P6, Entrepreneurial Skills)
CLO4: Evaluate vital organizational behaviours necessary to grow a new venture (PLO6, C5, A3, P6, Teamwork Skills)
CLO5: Motivate all stakeholders and build a cohesive venture team (PLO9, C3, A5, P7 Leadership Skills)

BVA3032
Vehicle Marketing
Credit Hour : 2
Prerequisite : None

Synopsis

This subject introduces the student to basic marketing concepts and how these concepts can be applied to entrepreneur technology setting in any organization. Additionally, they will be introduced to how management of the marketing function within technology based industries is critical to the entrepreneur’s success. This subject will take a close examination of the definition of marketing. Through a dissection of the key terms in the definition we will show that marketing’s primary focus is to identify and satisfy customers in a way that helps build a solid and, hopefully, sustained relationship that encourages customers to continue doing business with the entrepreneur. The student will come to understand that marketing consists of the strategies and tactics used to identify, create and maintain satisfying relationships with customers that result in value for both the customer and entrepreneur. This subject will help students plan, implement and evaluate decisions related to product know how, price, promotion and place to meet the needs of the technology based industries.

Course Learning Outcomes

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

CLO1: Acquire the knowledge of integrating technology into strategic marketing to create new business opportunities for entrepreneur.
CLO2: Analyze the various in marketing management activities and their roles in strengthening entrepreneur technology based industry competitiveness.
CLO3: Apply various marketing methods including presenting a marketing plan report.

BVA3013
Automomative 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 students can apply the obtained theory to the practical activities involving inspection for many aspects in automotive parts. This subject exposed the students to handle the project related to inspection for lamp, wheel, noise and emission level, the safety features and the automotive homologation. Every inspection activities required the students to present the technical report according to the universal standard.

Course Learning Outcomes

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

CLO1: Apply the knowledge and implement the theory for inspection process (C3, A4, P4, PLO6)
CLO2: Evaluate technical specification for each components and identity the problems (C5, A4, P5, PLO9)
CLO3: Analyze the technical aspects and qualified the checked components in automotive parts (C4, A5, P5, PLO8)

BVA3043
Asset and Inventory Management
Credit Hour : 3
Prerequisite : None

Synopsis

Students will be introduced to the maintenance strategy, calculating the life of each unit machine and instrument. identifying maintenance workshop and scheduling, maintenance organisation, effective use of maintenance resources, maintenance system, maintenance best practices, engineering economy such as weibull and pareto analysis,cost estimation, asset replacement analysis, risk analysis and control,application of reliability data, accident prevention, fire protection and cost control.

Course Learning Outcomes

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

CLO1: Distinguish the method and strategy for maintenance and asset management (PL03, C4)
CLO2: Reproduce by using computerized maintenance management system in maintenance problem. (PL02, P4)
CLO3: Present the best practices of maintenance and asset management. (PL07,A2)

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 encommpasses 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)

BVA3073
Risk Management
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, A1, P3 & 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. (C5, A2, P4 & PLO3)
CLO3: Collaborate effectively with others and demonstrate intellectual independence and autonomy to solve problems and/or address industry issues and imperatives. (C6, A3, P5 & PLO3)

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. (PLO1, C4, A3, P2)
CLO2: Use relevant theory to produce solution. (PLO6, C3, A1, P6)
CLO3: Choose a proper methodology. (PLO2, C5, A1, P1)
CLO4: Present the preliminary findings in the oral and written forms effetively (PLO4, C6, A2, P7)

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: Perform project implementation systematically.(PO9, C3, A2, P4)
CLO2: Interpret data in a meaningful form using relevant tools. (PO2, C3, A5, P1)
CLO3: Work independently and ethically. (PLO6, C3, A3, P3)
CLO4: Present the results in the oral and written forms effectively. (PO4, C3, A2,P3)

BVA3412
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 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, poduct 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, A5, P3)
CLO2: Explain effectively with the technical community and produce technical reports and presentations. (PLO4, C2, A4, P2)
CLO3: Demonstrate social ethique and professionalism in technology practice. (PLO8, C3, A3, P5)

BVA ELECTIVE COURSES

BVA2114
Commercial Vehicle Servicing & Maintenance
Credit Hour : 4
Prerequisite : None

Synopsis

A commercial vehicle is any type of motor vehicle used for transporting goods or paying passengers. The European Union defines a "commercial motor vehicle" as any motorized road vehicle, that by its type of construction and equipment is designed for, and capable of transporting, whether for payment or not. In this course, student will learn the rules and regulations service, maintainence and repair or commercial vehicles system and the engine.

Course Learning Outcomes

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

CLO1: Explain the rules, regulation and commercial vehicle system (P2, PLO1)
CLO2: Construct various skills of servicing and repair as an individual or a group. (P5, PLO2)
CLO3: Perform the servicing and maintenance according to Standard Operating Procedure (SOP) (A2, PLO8)

BVA2124
Drivetrain Maintenance
Credit Hour : 2
Prerequisite : None

Synopsis

Introduction to chassis load and tire contact forces. modeling of chassis dynamics in vertical, lateral and longitudinal directions. Performance criteria in suspension design. The use of suspension test machine for investigating the suspension characteristics. Effects of suspension parameters to the chassis dynamics. Semi-active and active suspension system.

Course Learning Outcomes

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

CLO1: Apply kinematics and dynamics principle to determine suspension forces due to chassis loads and tire contact forces. (PL01, C3)
CLO2: Undertake some basic tests for determining suspension parameters in the forms of force-velocity and force displacement characteristics (PLO2, P4)
CLO3: Explain the concept and the working principles of some advanced suspension systems such as active and semi-active suspension system (PLO3, C2)

BVA2134
Surface Design
Credit Hour : 4
Prerequisite : None

Synopsis

This course introduced surfacing method that is used to construct the 3D CAD data which usually applied in industrial field. The suitable features in constructing industrial design surfacing will be applied which helps producing the quality and efficiently surfaces data data for technical communication purpose. Students will have a mini project 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: Demonstrate knowledge and comprehension in constructing surfacing data for technical communication purpose (C3, P3, A2, PLO1)
CLO2: Justify the proper features to use in constructing surfacing data which emphasize the quality aspect (C5, P5, A3, PLO2)
CLO3: Construct surfacing data from the scanning data of automotive vehicles or components (C6,

P6, A4, PLO4)

BVA2144
Automotive Modelling
Credit Hour : 4
Prerequisite : None

Synopsis

This course provides the knowledge and skills regarding modelling process in automotive design development. From this course,students enable to apply various method and technique in modelling scale vehicle model, automotive component and fabricate working parts for automotive purposes.The course outlines opportunities to value add to professional skills developed during the course.

Course Learning Outcomes

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

CLO1: Demonstrate proficiency in working with and exploration of relevant materials,technology and processes
CLO2: Integrated various types of materials, tools and equipments used in modelling process
CLO3: Construct 3-Dimensional physical model based on 2-Dimensional data using suitable tools,equipments and materials

BVA2154
Vehicle Performance Analysis
Credit Hour : 2
Prerequisite : None

Synopsis

History of vehicle engines.Engine geometry, performance parameters of gas exchange for 4-stroke and two stroke. Spark ignition engine combustion. The market situation for the development of vehicles, gearboxes and components.The selection of the transmission ratio of the vehicle. Basic approach to the performance of automotive engines, power conversion, adjustment of the engine and transmission, transmission system design principles.

Course Learning Outcomes

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

CLO1: Analyse the historical development and future trend of engine (PL01, C2)
CLO2: Determine the design principle of engine (PL03, C4)
CLO3: Utilize the engine and chassis dynamometer for engine performance test. (PL02, P6)

BVA2164
Vehicle Fault Diagnosis
Credit Hour : 4
Prerequisite : None

Synopsis

This course introduces the diagnostic equipment, tools, engine diagnostic and general eelctrical system diagnostics.

Course Learning Outcomes

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

CLO1: Describe the various diagnostic tools and method used to check vehicle performance systems (drivetrain, powertrain and electrical components).
CLO2: Demonstrate the proper method to diagnos vehicle system (drivetrain, powertrain and electrical components).
CLO3: Present the precaution and methodology during diagnostic the vehicle system (drivetrain, powertrain and electrical components).

BVA2174
Exterior Design
Credit Hour : 4
Prerequisite : None

Synopsis

This courses aims to introduce exterior components. Important concept consideration of safe environment for the occupants. Active and passive safety system will be intorduce. Location, shape, surface hardness and supporting structures have to be carefully designed to protect the occupants.

Course Learning Outcomes

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

CLO1: Ability to describe the concept of exterior

components and system developed and manufactured components by various suppliers who work with OEM from beginning of design process. (PL01, C2)
CLO2: Ability to demonstrate and establish the car interor components with consideration of design for safety. (PL05, A4)
CLO3: Ability to consider and construct car exterior components, cargo and interface design, with consideration of ergonomics, design for cargo and human machine interface (HMI). (PL02, P5)

BVA2184
Component Remanufacturing
Credit Hour : 4
Prerequisite : None

Synopsis

This course aims to implement additive manufacturing and reverse engineering in retrofitting process. Student will be exposed with process in 3D Scanning until fabrication process by using Additive Manufacturing Technology. At the end of this course, student will be able to redesign and reconstruct automotive component by using selected tools and process.

Course Learning Outcomes

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

CLO1: Ability To correlate the broad range of Additive Manufacturing process, parameters,devices,capabilities and materials that available in remanufacture quality automotive component. (C4, PLO3)
CLO2: Ability To produce the parts and components by using selected additive manufacturing process and materials (P6, PLO2)
CLO3: Ability to organize systematic workflow and process in completing the task that have been given (A4,PLO9)

BVA3114
Hybrid Servicing
Credit Hour : 4
Prerequisite : None

Synopsis

Hybrid technology is an emerging technology. Development of high performance batteries and downsizing engines requires technologies to be familiar with this technology and manage to perform maintenance and servicing activities.

Course Learning Outcomes

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

CLO1: Explain the functions and operations of hybrid powertrain system and components (P2, PLO1)
CLO2: Construct various skills of servicing and repair as an individual or a group. (P5, PLO2)
CLO3: Perform the servicing and maintenance according to Standard Operating Procedure (SOP) (A2, PLO8)

BVA3124
EV Servicing
Credit Hour : 4
Prerequisite : None

Synopsis

This subject focuses on EV servicing and repair management

Course Learning Outcomes

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

CLO1: Analyse knowledge of EV Vehicle technology
CLO2: Apply knowledge of EV Vehicle Safety and Service Procedure
CLO3: Apply knowledge of EV Service Management at 3S Centre

BVA3134
Interior Design
Credit Hour : 4
Prerequisite : None

Synopsis

This courses aims to introduce interior components. Important concept consideration of safe environment for the occupants. Active and passive safety system will be intordue. Location, shape, surface hardness and supporting structures have to be carefully designed to protect the occupants.

Course Learning Outcomes

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

CLO1: Ability to describe the concept of interior components and system developed and manufactured components by various suppliers who work with OEM from beginning of design process.
CLO2: Ability to demonstrate and establish the car interor components with consideration of design for safety.
CLO3: Ability to consider and construct car interior components, cargo and interface design, with consideration of ergonomics, design for cargo and human machine interface (HMI).

BVA3144
Painting
Credit Hour : 4
Prerequisite : None

Synopsis

This courses aims to introduce the process and technique of automotive paiting. This course will help student to execute paiting jobs for automotive steel and plastic parts. Sticker wraping and water transfer will be introduced.

Course Learning Outcomes

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

CLO1: Ability to describe the concepts and methodologies of automotive painting process, technology and materials in industrial practice.
CLO2: Ability to apply and produce surface preparation for painting, wrapping and water transfer on steel and plastic parts.
CLO3: Ability to apply and produce good technique on painting, wrapping and water transfer on finished steel and plastic parts.

BACHELOR IN MECHANICAL ENGINEERING TECHNOLOGY (DESIGN AND ANALYSIS) WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

Bachelor of Mechanical Engineering Technology (Design and Analysis) with Honours

YEAR	FIRST		SECOND		THIRD		FOURTH (WBL IN INDUSTRY)	
SEM	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**
COURSES	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						
TOTAL CREDIT	**18**	**20**	**18**	**19**	**19**	**17**	**17**	**12**
TOTAL CREDIT FOR GRADUATION	**140**							

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
Total Minimum Credit of Elective Subjects for Graduation			**12**

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

PEO 1: Graduates are capable of applying technical knowledge and practical skills to solve Mechanical Engineering Technology (Design and Analysis) problems.

PEO 2: Graduates are capable of engaging with continuous development and adopt evolving technologies.

PEO 3: Graduates are competent, responsible and practice professionalism.

PROGRAMME LEARNING OUTCOMES (PLO)

PLO 1: Apply the knowledge of technology fundamental to broadly-defined procedures, processes, systems and methodologies in the field of study.

PLO 2: Propose and employ current tools and techniques to resolve broadly-defined problems.

PLO 3: Demonstrate deep investigative and significant thinking abilities to solve broadly-defined problems in the field of study.

PLO 4: Communicate effectively and flexibly in oral and written language for social, academic and professional purposes.

PLO 5: Illustrate the understanding of corresponding issues related to the society and the subsequent responsibilities to the broadly-defined technology practices.

PLO 6: Acknowledge the requirement of professional establishment and to employ independent continuing learning in specialist technology.

PLO 7: Illustrate consciousness of management and technopreneurship routine in real perspective.

PLO 8: Illustrate ethical awareness and professionalism.

PLO 9: Illustrate leadership character, mentoring and work efficiently in diverse teams.

COURSE SYNOPSIS

CURRICULUM STRUCTURE 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: Product Development 1

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 introduce 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 expose 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 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)
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)

BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (AUTOMOTIVE) WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (AUTOMOTIVE) WITH HONOURS

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEM	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND
COURSES	BTD1112 Statics	BTD1212 Product Development 1	BTD2113 Product Development 2	BTD2213 Product Development 3	BTD3114 Product Development 4	BTD3124 Product Development 5	BTA4112 Final Year Project	BTD4212 Industrial Training
	BTD1123 Engineering Materials	BTD2123 Fluid Mechanics	BTD1222 Dynamics	BTD3123 Finite Element Analysis	BTD2223 Mechanical Vibration	BTA3233 Autotronics	BTD4131 Occupational Safety and Health	
	BTD1133 Electrical and Electronics Technology	BTD1243 Computer Programming	BTD2133 Strength of Materials	BTD2232 Applied Control System	BTA3133 Powertrain	BTA3243 Fault Diagnosis	BTD4122 Professional Practice and Ethics	
	BTD1151 Mechanical Laboratory 1	BTD1251 Mechanical Laboratory 2	BTD2142 Mechanical Measurement and Instrumentation	BTD2252 Hydraulic and Pneumatic	BT*3*** Elective 1	BT*3*** Elective 4	BTD3222 Internship Preparation	
	BTD1143 Manufacturing Processes	BTD1233 Thermodynamics	BTD2242 Heat Transfer	BTA2663 Automotive Technology	BT*3*** Elective 2	UGE2002 Technopreneurship		
	BUM1113 Technical Mathematics	BUM1223 Calculus	BTD2273 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						
TOTAL CREDIT	**19**	**19**	**19**	**18**	**19**	**15**	**17**	**14**
TOTAL CREDIT FOR GRADUATION	**140**							

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
Total Minimum Credit of Elective Subjects for Graduation			**12**

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

CURRICULUM STRUCTURE 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: Product Development 1

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 introduce 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 expose 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 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)
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)

BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (OIL AND GAS) WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

Bachelor of Mechanical Engineering Technology (Oil and Gas) with Honours

ELEC

YEAR	FIRST		SECOND		THIRD		FOURTH (WBL IN INDUSTRY)	
SEM	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND**
COURSES	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 andEthics	
	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						
TOTAL CREDIT	**18**	**20**	**18**	**19**	**19**	**17**	**17**	**12**
TOTAL CREDIT FOR GRADUATION	**140**							

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
Total Minimum Credit of Elective Subjects for Graduation			**12**

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

CURRICULUM STRUCTURE 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: Product Development 1

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 introduce 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 expose 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 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)
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)

اونيۏرسيتي مليسيا ڤهڠ
UNIVERSITI MALAYSIA PAHANG

CENTRE FOR MATHEMATICAL SCIENCES

UNDERGRADUATE PROSPECTUS 2021/2022

BACHELOR OF APPLIED SCIENCE IN DATA ANALYTICS WITH HONOURS

CONTENTS

CURRICULUM STRUCTURE

BACHELOR OF APPLIED SCIENCE IN DATA ANALYTICS WITH HONOURS
2u2i MODE (2.5u 1i)

YEAR	FIRST		SECOND		THIRD		FOURTH
SEM	**FIRST**	**SECOND**	**FIRST**	**SECOND**	**FIRST**	**SECOND (Block Release - Industry)**	**FIRST (Block Release - Industry))**
FACULTY & PROGRAMME COURSES	UHL2400 Fundamentals Of English Language	UHL2412 English For Academic Communication	UHF2**1 Foreign Language II	UHL2422 English For Technical Communication	UHL2432 English For Professional Academic Report Writing	BSD4**3 Elective I	BSD4812 Industrial Training
	UHC1012 Falsafah & Isu Semasa	UHF1**1 Foreign Language I	UHC2022 Penghayatan Etika & Peradaban	UQ*20*1 Co Curriculum II	BSF2112 Industry Quality Management	BSD4**3 Elective II	
	UHL1022 Softskills	UQ*10*1 Co Curriculum I	UGE2002 Technopreneurship	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 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	BSD3712 Research Methodology	BSD3722 Data Science Project I		
	BCI1143 Problem Solving	BPQ1223 Principles of Operation Management	BCI2023 Database System	BSD3143 Operational Research			
TOTAL CREDIT	**18**	**19**	**20**	**20**	**18**	**13**	**12**
TOTAL CREDIT FOR GRADUATION	**120**						

The information provided by Centre for Mathematical Sciences are based on University's Regulation and endorsement until 1 July 2021

ELECTIVE COURSES FOR
BACHELOR OF APPLIED SCIENCE IN DATA ANALYTICS WITH HONOURS

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
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	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.

PROGRAMME OUTCOMES (PO)

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 FOR PROGRAMME COURSES

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, sampling distributions and estimation theories, optimal test of hypotheses, and introduction to Bayesian methods for inference. 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: Perform statistical analysis by using appropriate mathematical statistics theory and methodology.
CO3: Provide solution to the related problems of real life data in various disciplines.

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, dynamics of data wrangling and data transformation. Students will learn how to gather and extract data from widely used data formats. 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 intelligence. This course aims to introduce students to the theory and practice of the AI. In this course, student will learn basic search, heuristics and metaheuristics, knowledge representation system, information processing and robotics. 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.

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.

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.

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 analyzing 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 2k 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: State a clear and generally accepted statement of problem.
CO2: Apply the basic principle of experimental design for various data sets from many different fields.
CO3: Construct a powerful data analysis by using an appropriate software tools.
CO4: Communicate effectively in written and oral form through group discussion (assignment) and presentation session.
CO5: 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, modelling 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: Acquire 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: Distinguish the machine learning concepts and methodologies in computer science.
CO2: Apply the machine learning models 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. WEKA/ Python/ SAS Enterprise Miner/ Knime software is used by students to implement these ideas in practice.

Course Outcome

By the end of semester, students should be able to:
CO1: Distinguish the data mining concepts and methodologies in computer science.
CO2: Apply data mining model prototype/module and demonstrate critical thinking ideas in data mining knowledge and problem-solving
CO3: Construct the programming codes or workflows using appropriate predictive 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

Learning activities are focused on developing workable research project proposal comprising identification of (i) problem statement, (ii) objectives, (iii) literature reviews and (iv) methodology. Each student is assigned to a supervisor (lecturer); based on field of expertise. 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 supervisor. 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: Analyze 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

This course is a continuation of BSD3722 Data Science Project I. Learning activities are directed on completion of individual project (by supervisor monitoring) including preparation and presentation. The project objectives are planned to be delivered by active/engaged learning with supervisor and industrial coach, practical laboratory work, self-reading and draft preparation. Students will gather suitable data to answer project objectives; handling data analysis and discussion prior project writing. Students are assessed based on complete draft of project; effective communications of their findings during oral presentation and log book arrangement. 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
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: BSD2423

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 principal components analysis, factor analysis and discrimination and classification are introduced. An introduction to matrix algebra and multivariate normal distribution theory are also discussed. The course also covers relevant multivariate methods in R Language.

Course Outcome

By the end of semester, students should be able to:
CO1: Differentiate between multivariate and univariate methods and discuss the assumptions placed on multivariate methods in detail.
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 and multivariate 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 regression models. Time series models play an important role in analysing the variability inherent in biological, medical and engineering processes, and in dealing with the uncertainties affecting managerial decisions. Appropriate software such as R language or Minitab shall be used by students to implement some of these ideas in practice.

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.

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 computer science
CO2: Apply deep learning model prototype/module and demonstrate critical thinking ideas in deep learning knowledge and problem-solving
CO3: Conduct appropriate tools to solve deep learning problems.
CO4: Demonstrate verbal and written communication skills.
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 data display, summary statistics, probability functions and circular models, parameter estimation, hypothesis testing, correlation and regression, and some modern methodology for circular statistics. 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 mathematical foundation concepts of circular data analysis.
CO2: Produce statistical analysis for circular data by using appropriate statistical theory and methodology.
CO3: Manipulate circular statistics theory and methodology 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, 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 i.e management, manufacturing, service industry, transportation, marketing, finance, medicine, law, military and public policy, 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: Acquire fundamental principle of decision analysis.
CO2: Analyse mathematical problems using decision analysis methods.
CO3: Provide solution to industrial problems using decision analysis tools.
CO4: Demonstrate verbal and written communication skills.
CO5: Demonstrate good interest and initiative to explore decision making and analysis in real world applications.

BSD4633 Forensic Data Analysis
Credit Hour: 3
Prerequisite: None

Synopsis

The resulting challenge for forensic scientists or statisticians is to produce, process, and present accurate data that will assist legal decision makers in reconstructing past events. The concomitant challenge for the legal system is to achieve an optimal balance between completeness and comprehensibility of quantitative testimony. This course describes the tools of modern Bayesian decision theory, by illustrating their application to paradigmatic, types of data in forensic science, and by defending the procedures against various objections. The course cover elements of the theory probability, likelihood, and utility then apply them in the form of Bayes' rule and loss functions to the recurrent statistical problems of estimation, classification, and decision.

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: Provide solution to forensic data problems arise into real life data.
CO4: Demonstrate verbal and written 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, heteroscedasticity, logistic regression model and simultaneous equation models 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 such as Minitab.

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: Acquire the fuzzy set theory concepts and methodologies in real world phenomena
CO2: Apply fuzzy system prototype/module and demonstrate critical thinking ideas in fuzzy knowledge and problem-solving.
CO3: Conduct appropriate tools to solve uncertain event.
CO4: Demonstrate verbal and written communication skills.
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 emphasise GIS data collection, entry, storage, analysis, and output using appropriate software such as 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: Analyse spatial data of GIS.
CO3: Conduct appropriate tools to solve GIS problems.
CO4: Demonstrate verbal and written communication skills.
CO5: Demonstrate good interest and initiative for exploring issues in GIS for a given task.

BSD4673 Risk Analysis
Credit Hour: 3
Prerequisite: BSD2423

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 multi attribute utility, and application of risk analysis and pitfalls of risk analysis. Many examples will come from real life data.

Course Outcome

By the end of semester, students should be able to:
CO1: Acquire knowledge of the basic concepts of risk analysis including probability theory and modelling, risk and decision analyses.
CO2: Apply probability, probabilistic modelling and probabilistic simulation for risk analysis including decide the issues/problem of real problems.
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.

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 log book. Students will be supervised by industry coach and university supervisor 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 final 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 good ethics and professionalism in the workplace

MATHEMATICS SERVICE COURSES

CONTENTS

CURRICULUM STRUCTURE

CENTRE FOR MATHEMATICAL STRUCTURE
MATHEMATICS SERVICE COURSES IN MATHEMATICS SERVICE

NO.	CODE	COURSE	CREDIT HOUR
1	DUM1113	Basic mathematics	3
2	DUM1123	Calculus	3
3	DUM1213	Fundamental discrete structure	3
4	DUM2113	Technical mathematics	3
5	DUM2413	Statistics & probability	3
6	DUM2512	Introduction to data science	3
7	BUM1113	Technical mathematics	3
8	BUM1123	Mathematics for management	3
9	BUM1133	Mathematics for computer graphics	3
10	BUM1153	Intermediate mathematics	3
11	BUM1223	Calculus	3
12	BUM1233	Discrete mathematics and applications	3
13	BUM1433	Discrete structure & applications	3
14	BUM2113	Applied mathematics	3
15	BUM2123	Applied calculus	3
16	BUM2133	Ordinary differential equations	3
17	BUM2413	Applied statistics	3
18	BUM2433	Statistics for management	3

COURSE SYNOPSIS

COURSE SYNOPSIS FOR MATHEMATICS SERVICES 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.
CO3: Provide solution for the wide range of problems in computer science by using mathematics principle.

BUM1153
Intermediate 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.

BUM1223
Calculus
Credit Hour: 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 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.
CO3: Use appropriate software and tool to solve the graphical and computational problems in calculus.

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 and Fourier series.
CO2: Analyze 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: Analyze and solve various differential equation of first order differential equations, second order differential equations, Laplace transforms and find Fourier series for various 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.

BUM2413
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 (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 contigency tables. 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 statistics.
CO2: Perform statistical analysis by using appropriate statistical theory and methodology.
CO3: Analyse real life data to solve related problems in various disciplines.

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 exposes 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.

DUM1213
Fundamental Discrete Structure
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 logic, set theory, elementary number theory, functions and relations, basic of counting, boolean algebra, and proof techniques. 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.
CO3: Provide solution to discrete mathematics problems arise from computer science and engineering field.

DUM2113
Technical Mathematics
problems in various disciplines.

DUM2413
Statistics & Probability
Credit Hour: 3
Credit Hour: 3
Prerequisite: None

Synopsis

This course introduces Analytic Geometry & Conic Section, Parametric Equations, Polar Coordinates, Three-Dimensional Spaces, Vectors, and First Order Differential Equations. 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 technical mathematics.
CO2: Apply the knowledge of Analytic Geometry & Conic Section, Parametric Equations, Polar Coordinates, Three-Dimensional Spaces, Vectors and First Order Differential Equations to solve various science and engineering problems.

DUM2413
Statistics & Probability
Credit Hour: 3
Prerequisite: None

Synopsis

In this course, students are exposed to basic statistics and analyse 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 principles statistics.
CO2: Perform statistical analysis by using appropriate statistical theory and methodology.
CO3: Analyse real life data to solve related
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.

اونيۏرسيتي مليسيا ڤهڠ
UNIVERSITI MALAYSIA PAHANG

CENTRE FOR HUMAN SCIENCES

UNDERGRADUATE PROSPECTUS 2021/2022

CENTRE FOR HUMAN SCIENCES

CONTENTS

CURRICULUM STRUCTURE

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SOFT SKILLS DEPARTMENT		
1	UHS 1022	Soft Skills
ELECTIVE COURSES		
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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
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17	UHE3272	Introduction To Social Science
18	UHE3282	Pengajian Palestin
19	UHE3292	Introduction To Islamic Astronomy
20	UHE3302	Pengantar Sains Politik
21	UHE3312	Introduction To International Law
22	UHE3322	Introduction To Islamic Medication Practice
23	UHE3332	Zikir (Islamic Remembrance) For Human Development
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26	UHE3362	Pengantar Teknologi Pendidikan
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COURSE SYNOPSIS

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
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3. Phillips, D. C. (Ed.) (2014). Encyclopaedia of Educational Theory and Philosophy (1st Ed.). SAGE Publication
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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.
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5. Wan Abdul Rahman Latif et.al, Sejarah Perkembangan Tamadun Dunia, DBP, Kuala Lumpur, 2001.
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.
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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.
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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

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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

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5. Norani Othman, Sumit K. Mandal (ed), (2000). Malaysia Menangani Globalisasi (Peserta atau Mangsa). Bangi, Selangor: Penerbit Universiti Kebangsaan Malaysia
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7. Zulhilmi 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

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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
Prerquisite : 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.
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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

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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. ZulkifliMohamad)(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
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8. Jomo, K.S. (1998). *Pembangunan Ekonomi dan Kelas Sosial di Semenanjung Malaysia*. Kuala Lumpur: Dewan Bahasa dan Pustaka.
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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 ijtihad (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, solah 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). Fiqah 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 Tamadun Islam. Skudai: UTM Press
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.
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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 copetence 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 Janee 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.

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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.

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11. Hunter, William D. 2004. "Got global competency?" International Educator, Spring 2004, 6---12.

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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.

16. ______. 2008. "Toward Intercultural Personhood: Globalization and a Way of Being." Globalization and Diversity [Special Issue]. International Journal of Intercultural Relations 32, 4:359-368.

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 prounce 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 general rules of maharij

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.
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8. Haji Abdul Qadir Leong (1994). Tajwid al-Quran.Pustaka Slam Sdn Bhd: Kuala Lumpur.

Additional references:

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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 prounce 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).
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5. Ibrahim Abdul Mun'im Asy-Syaarbani (2014). Cara Mudah Menghafal Al-Quran.Kuala Lumpur: Pustaka Al-Shafa.
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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 prospective.
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

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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.
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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 Universitiy 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
C03: Demonstrate (orally and in written form) the knowledge in current issues of stratification, globalization, technology, environment, deviance, race, ethnicity, age, and gender

References

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Course code : UHE3282
Course : PENGAJIAN PALESTIN
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
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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.
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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 trinogometry 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.
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Course code: UHE3302
Course: PENGANTAR SAINS POLITIK
Pre-requisite: None

Synopsis

Kursus ini memperkenalkan perkara-perkara asas dalam ilmu sains politik. Perbincangan berkisarkan aspek kuasa, kewujudan negara, kedaulatan, undang-undang, perlembagaan, doktrin pengasingan kuasa, kerajaan, autokrasi dan demokrasi. Justeru, para pelajar akan celik politik untuk membicarakan perihal urus tadbir dan pengurusan negara.

Course Outcomes
CO1: Menghuraikan konsep-konsep asas sains politik.
CO2: Menerangkan isu-isu berkaitan konsep-konsep asas sains politik.
CO3: Membincangkan pengamalan konsep-konsep asas politik berdasarkan contoh-contoh negara tertentu.

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

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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'
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5. Jalaluddin Abdul Rahman As-Suyuti (terjemahan Nor Azlina Abd. Aziz). Kaedah Perubatan Rasulullah SAW. Kuala Lumpur: Synergy Publishing Co
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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: Cheracterize 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
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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 : PEMIKIRAN STRATEGIK TOKOH-TOKOH TERKEMUKA ASIA

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.
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6. James Wise, Thailand: History, Politics and the Rule of Law
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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).
5. Al-Yubi, Muhammad Sa‘d bin Ahmad, Maqasid al-Shari‘ah al-Islamiyyah wa ‘Alaqatuha bi al- Adillah al-Shar‘iyyah (Riyad : Dar al-Hijrah, 1998).

Course code : UHE3362
Course : PENGANTAR TEKNOLOGI PENDIDIKAN
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

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2. Noriati A. Rashid. (2009). Teknologi dalam pengajaran dan pembelajaran. LB1028.3.T45 2009
3. Pengajaran dan pembelajaran : teori dan praktis. LB1025.3.P46 2009
4. Innovations in mobile educational technologies and applications. LB1028.3.I56 2013
5. 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

1. 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.
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3. Joe Y. F. Lau. 2011. An Introduction to Critical Thinking and Creativity: Think More, Think Better. John Willey & Sons : Canada.
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8. Yavuz Ercil. 2020. Systems and Systems Thinking. Trafford : Canada.
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12. Sheryl Burgstahler. 2015. Universal Design in Higher Education: From Principles to Practice. Harvard Education Press. (ISBN 1612508170, 9781612508177).
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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.
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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 sudying 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 miraculuos (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 miraculuos nature of Quran
CLO3: identify verses relating to miraculuous matters taught in the Quran

References

Al-Hidayah, Kuala Lumpur.

إعجاز القرآن)ت: صقر(
1. محمد بن الطيب أبو بكر الباقلاني:

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

1. Abdul Latif Abdul Razak. (2019). *Spiritual health: Conceptual, philosophical and practical aspects of Iman Restoration Therapy*. Kuala Lumpur: IIUM Press.
2. Ansari, Zafar Afaq (Ed.). (1992). *Qur'anic concepts of human psyche.* Islamabad, Pakistan: International Institute of Islamic Thought.

3. Al-Attas, Syed Muhammad Naquib. (2014). *Prolegomena to the metaphysics of Islam: An exposition of the fundamental elements of the worldview of Islam*. Johor Bahru, Johor: UTM Press.
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10. Najati, Muhammad Ustman. (2008). *Psikologi rasulullah s.a.w* (Yahya Nuryadi, Terj.). Kuala Lumpur: Darul Nu'man.
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اونيۏرسيتي مليسيا ڤهڠ
UNIVERSITI MALAYSIA PAHANG

CENTRE FOR MODERN LANGUAGES

UNDERGRADUATE PROSPECTUS 2021/2022

CENTRE FOR MODERN LANGUAGES

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CURRICULUM STRUCTURE

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Courses offered by the Department 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)

*Offered to degree students only
*Students select one foreign language and complete two levels of the selected language.

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
UHF1161	Malay for Beginners (For international students only) (Not Offered)
UHF1271	Turkish 1 (Not offered)

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
UHF2161	Malay for Intermediate (For international students only)
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Double Degree Programme

Faculty of Industrial Management (FIM)

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UHG1012	Deutsch 2
UHG2002	Deutsch 3
UHG2012	Deutsch 4

Faculty of Manufacturing and Mechatronics Engineering Technology (FTKPM)
Faculty of Mechanical and Automotive Engineering Technology (FTKMA)

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UHG1013	German 2
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UHG2003	German 3
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UHE3022	Critical Thinking through Literature
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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 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 transfer information from spoken to written texts.
CO2 identify relevant information in straightforward factual texts.
CO3 write 4-paragraph essays complete with an introduction and a conclusion.
CO4 communicate routine and non-routine matters on familiar subjects.

References

1. Bland, S. K. (2012). Grammar Sense 3. Oxford University Press.
2. Craven, M. & Donalley-Sherman, K. (2015). Q Skills for success: Listening and speaking 3. Oxford University Press.
3. Cole, V. (2012). IELTS introduction: Study Skills pack. Macmillan Education.
4. Soars, L. & Soars, J. (2015). Academic skills: Reading, writing and study skills. Oxford University Press.

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) and study skills for academic success. E-learning platforms will be an integral part of the course. Students will have the opportunity to read texts of various topics by incorporating essential reading skills. Study skills such as note-taking and note making techniques, and active listening skills are also emphasised. Students will also be required to write thesis-support essays, applying and appropriate writing styles and organization as well as integrating APA writing conventions. Additionally, students are also expected to demonstrate effective presentation skills in delivering speeches. This course is defined within the CEFR B1 to B2 level.

Course Outcomes

CO1 construct written and/or spoken responses using appropriate and accurate language.
CO2 identify specific and significant information from various texts and purposes.
CO3 apply effective presentation skills using appropriate non-verbal cues.
CO4 distinguish 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. Hafizoah Kassim, Noor Raha Mohd Radzuan, Nor Yazi Khamis, Zuraina Ali, Zarina Mohd Ali. (2014). No Plagiarism!. Penerbit UMP.
3. Savage, A. Shafiei, M et al. (2012). Effective Academic Writing. Oxford University Press.

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 the 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 apply appropriate and accurate language in written and/or spoken communication.
CO2 deliver relevant information in written and/or spoken communication.
CO3 demonstrate effective delivery skills in presenting information.

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 (8th 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 (11th 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.

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 in defined within the CEFR A2 to B1 level.

Course Outcomes
CO1 distinguish between main ideas and supporting details in spoken texts on familiar subjects.
CO2 identify specific, predictable information in simple short texts.
CO3 write straightforward connected texts on familiar subjects using the basic essay structure.
CO4 communication effectively on routine and non-routine matters of familiar subjects.

References

1. Bland, S.K. (2012). Grammar sense 3. Oxford: Oxford University Press.
2. Cole, V. (2012). IELTS introduction: Study skills pack. London: Macmillan Education.

3. Craven, M. & Donalley-Sherman, K. (2015). Q skills for success: Listening and speaking 3. Oxford: Oxford University Press.
4. Soars, L. & Soars, J. (2015). Academic skills: Reading, writing, and study skills. Oxford: Oxford University Press.
5. https://learnenglish.britishcouncil.org
6. https://www.bbc.co.uk/learningenglish/
7. https://www.time4writing.com/
8. https://patternbasedwriting.com/
9. https://www.cambridgeenglish.org/exams-and-tests/cefr/
10. https://www.englishprofile.org/thecefr

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) and study skills for academic success. E-learning platforms will be an integral part of the course. Students will have the opportunity to read texts of various topics by incorporating essential reading skills. Study skills such as note-taking and note making techniques, and active listening skills are also emphasised. Students will also be required to write thesis-support essays, applying and appropriate writing styles and organization as well as integrating APA writing conventions. Additionally, students are also expected to demonstrate effective presentation skills in delivering speeches. This course is defined within the CEFR B1 to B2 level.

Course Outcomes
CO1 construct written and/or spoken responses using appropriate and accurate language.
CO2 identify specific and significant information from various texts and purposes.
CO3 apply effective presentation skills using appropriate non-verbal cues.
CO4 distinguish 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. Hafizoah Kassim, Noor Raha Mohd Radzuan, Nor Yazi Khamis, Zuraina Ali, Zarina Mohd Ali. (2014). No Plagiarism!. Penerbit UMP.
3. Savage, A. Shafiei, M et al. (2012). Effective Academic Writing. Oxford University Press.

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, organise, 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 determine salient information from listening tasks related to technical communication.
CO2 demonstrate presentation skills using appropriate delivery strategies.
CO3 transfer salient information from technical reading materials and documents into appropriate format.
CO4 apply appropriate and accurate language in written and/or spoken discourse.

References

1. Tebeaux, E., & Dragga, S. (2017). The essentials of technical communication (4[th] ed.). Oxford University Press.
2. Gerald, J. A., Walter, E. O., & Charles, T. B. (2020). Handbook of technical writing with 2020 APA update (12[th] ed.). Bedford/St. Martin's.
3. Walter, E. O., Charles, T. B. & Gerald, J. A. (2020). Writing that works: Communicating effectively on the job with 2020 APA update (13[th] ed.). Bedford/St. Martin's.
4. Brigeford, T. (2018). Teaching professional & technical communication: A practicum in a book (1[st] ed.). Utah State University Press.
5. Ghetto, G., Jack, T. L., & Ruszkiewicz, S. (2019). Content strategy in technical communication (1[st] ed.). Routledge Press.

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 the 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 apply appropriate and accurate language in written and/or spoken communication.
CO2 deliver relevant information in written and/or spoken communication.
CO3 demonstrate effective delivery skills in presenting information.

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[th] 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[th] 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 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 transfer information from spoken to written texts.
CO2 identify relevant information in straightforward factual texts.
CO3 write 4-paragraph essays complete with an introduction and a conclusion.

CO4 communicate routine and non-routine matters on familiar subjects.

References

1. Bland, S. K. (2012). Grammar Sense 3. Oxford University Press.
2. Craven, M. & Donalley-Sherman, K. (2015). Q Skills for success: Listening and speaking 3. Oxford University Press.
3. Cole, V. (2012). IELTS introduction: Study Skills pack. Macmillan Education.
4. Soars, L. & Soars, J. (2015). Academic skills: Reading, writing and study skills. Oxford University Press.

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 processers 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
This course trains students to communicate in languages that cover basic daily life situations. Students will be introduced to spoken and written Malay language easily. Basically, students will learn the sounds and references contained in the Malay language, in turn, will be exposed to an environment that is closest to the students ranged from about myself, family and friends, the surrounding environment, cases in conversation and fun activities in Malaysia. Teaching and learning will be implemented in the form of lectures, tutorials, assignments and student learning experiences in and out of the classroom. At the end of this course, students are expected to be able to communicate and write using simple sentences effectively.

Course Outcomes
HPK 01: recognize sounds in spoken English;
HPK 02: explains the meaning of the full text;
HPK 03: speak in a variety of situations using simple sentences and layered sentences;
HPK 04: organizing ideas creatively and systematically in writing short compositions.

References
1. Juwairiah Osman & Jamilah Bebe Mohamad. (2018). Modul "Malay For Beginners." Penerbit: Universiti Malaysia Pahang, Kuantan.

2. Jamilah Bebe Mohamad. (2016). Modul "Malay For Intermediate".
3. Zarina Othman, Roosfa Hashim dan Rusdi Abdullah. (2016). Modul Komunikasi Bahasa Melayu Antarabangsa. Penerbit: Universiti Kebangsaan Malaysia.
4. Nor Hashimah Jalaluddin, Mardian Shah Omar dan Noor Zilawati Jais. (2007). Bahasa Melayu untuk Penutur Asing. Penerbit: Dewan Bahasa dan Pustaka.

*Offered to degree students only
*Students select one foreign language and complete two levels of the selected language.

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 and basic sentence structures. Practices that based on HSK Level One grammar point are also introduced. Classroom activities 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 Ai or HSK Level 1.

Course Outcomes
CO1 recognize pronunciation of simple Chinese words, phrases and sentences from audio media or recordings in clearly defined, familiar everyday contests.
CO2 describe topics of personal interests in clearly defined, familiar contexts using simple Chinese sentences.
CO3 identify information about familiar subject from straight-forward connected texts.
CO4 write simple phrases and sentences in Hanyu Pinyin about clearly defined, familiar contexts.

References

1. Confucius Institute Headquarters (Hanban) HSK Test Syllabus Level 1 Beijing: People’s Education Press.
2. Jiang Liping HSK Standard Course 1: Text Book Beijing Language & Culture University.
3. Jiang Liping HSK Standard Course 1: Work Book Beijing Language & Culture University.
4. Yong Ying Mei & Cheng Ching Yee (2018), Mandarin for All: Book 1 (Second edition).Penerbit UMP, Pahang, Malaysia

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 structure. 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 recording in clearly defined, familiar everyday context.
CO2 produce simple sentences about topics of personal interests in clearly defined, familiar everyday context using simple German sentences.
CO3 identify information about familiar subject from short and simple texts.
CO4 write simple phrases and sentences in German.

References

1. Daniela Niebisch, Slyvette Penning-Hiemstra, Franz Specht, Monika Bovermann and Monika Reimann, Schritte international 1 (Kursbuch + Arbeitsbuch) (2013), Hueber Verlag, Ismaning, Germany.
2. Yanti Salina Shaari, Deutsch für Anfänger - German for Beginners (2012), Penerbit UMP.
3. Monika Reimann, Grundstufen-Grammatik für Deutsch als Fremdsprache : Erklärungen und Übungen (2010), Hueber Verlag, Ismaning, Germany.

Course Code: UHF1131
Course: JAPANESE FOR BEGINNERS
Pre-requisite: none

Synopsis

As the main aim of this course is basic communicative competence, learning in the classroom will be based on language tasks which students are likely to perform in real life, either in their native country or in Japan. Students will be equipped with basic communicative competence in the aspects of self-development, knowledge acquisition and social interaction. The students will be evaluated based on the four language skills- listening, speaking, reading and writing. By the end of this course, students should be able to attempt the Exam or the Common European Framework of References for Languages (CEFR) Pre- A1 to low A1 level.

Course Outcomes
CO1 recognise pronunciation of simple Japanese words and sentences from audio or recordings.
CO2 produce simples Japanese sentences about topics of personal interests.
CO3 apply basic reading skills to comprehend straight-forward connected texts.
CO4 write simple words and sentences in Hiragana.

References

1. Mohd Iszuani bin Mohd Hassan, (2008). KihonTeki Na Nihongo 1: UMP
2. Mohd Iszuani Mohd Hassan, Iszuani Inazuna Jap Soft ware. UMP.
3. www.hiragana-katakana.com
4. genkijapan.net

Course Code: UHF1141
Course: ARABIC FOR BEGINNERS
Pre-requisite: none

Synopsis

This course focuses on basic Arabic communicative skills. Learning is 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 CEFR of 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 describe topics of personal interests in clearly defined, familiar contexts using simple Arabic sentences.
CO3 identify information about familiar subject from straight-forward connected texts in clearly defined, familiar contexts using simple Arabic sentences.
CO4 write simple phrases and sentences in Arabic in clearly defined, familiar contexts using simple Arabic sentences.

References

1. Mardhiyyah Zamani,Rosjuliana Hidayu Rosli,Mohammad Baihaqi bin Hasni. Arabic for Beginners. ,Penerbitan UMP, 2012
2. Bahasa Arab untuk Semua, Asar Abdul Karim, Penerbitan UMP. 2008
3. Marzuki Yaakob, Abdul Hadi Mohd Salleh, At-Taujih fil'Arabiyyah Al-Ittisaliyyah. UPENA, UiTM Shah Alam.

Course Code: UHF1151
Course: SPANISH FOR BEGINNERS
Pre-requisite: none

Synopsis

The 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 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 recording in clearly defined, familiar everyday context.

CO2 describe topics of personal interests in clearly defined, familiar contexts using simple Spanish sentences.

CO3 identify information about immediate familiar subject from straight-forward texts.

CO4 write simple phrases and sentences in Spanish.

References

1. Azlina Mohd Ariffin (2017) Estudiar Español Conmigo (nivel 1) : UMP
2. Dorothy Richmond. Basic Spanish. The Mcgraw-Hill Companies.
3. William C. Harvey. Spanish Every Day. Barron's Educational Series.
4. Collins Dictionary. English to Spanish, Spanish to English, Fourth Edition, Harper Collins Publisher.

Course Code: UHF1271
Course: TURKISH 1
Pre-requisite: none
*Not offered

Synopsis

This course aims to enable students to speak simple Turkish in their daily life. Classroom activities include listening and speaking skill practices. Reading and writing activities are also included to enhance the spoken skills, and practices on certain basic grammar are also introduced. Students are evaluated on all four language skills – listening, speaking, reading and writing. The course also covers constructing basic Turkish phrases and sentences.

Course Outcomes

CO1 communicate in basic sentences.

CO2 read selected short texts.

CO3 listen accurately to the pronunciation of Turkish syllables, words and phrases.

CO4 write simple sentences and short paragraphs in Turkish.

References

1. Tuncay Ozturk & Committee. (2010). Acilim Turkce Ders Kitabi 1 (Turkish Language Textbook 1). Turkey: Caglayan Publication.
2. Tuncay Ozturk & Committee. (2010). Acilim Turkce Calisma Kitabi 1 (Turkish Language Workbook 1). Turkey: Caglayan Publication.
3. Pollard, A.C. & Pollard, D. (2010). *Teach Yourself Complete Turkish.* London: Hodder Headlines.
4. Göksel, A. & Kerslake, C. (2010). *Turkish: An Essential Grammar*. London: Routledge.
5. Kurklu, A. (2008). *Turkish Phrasebook.* Australia: Lonely Planet Publication.
6. Öztopçu, K. (2009). *Elementary Turkish. A Complete Course for Beginners.* Turkey: Sanat Kitabevi.
7. Csato, J & Johanson, L. (2007). *The Turkic Languages.* London: Routledge.
8. Lewis V. Thomas. (2012). *Elementary Turkish.* New York: Dover Publication.
9. Yasar Kuzucu. (2014). *The Delights of Learning Turkish: A self-study course book for learners of Turkish.* Germany: Create Space Independent Publishing Platform.
10. Anonymous. (2008). *Turkish Phrase Book and Dictionary.* London: Berlitz Publishing.
11. http://www.digitaldialects.com/Turkish.htm
12. http://www.hello-world.com/languages.php/?language=Turkish/
13. https://turkce.yee.org.tr/
14. http://www.turkishclass.com/

Intermediate Level

Course Code: UHF2111

Course: MANDARIN FOR INTERMEDIATE
Pre-requisite: UHF1111 Mandarin for Beginners

Synopsis

The course aims to expose students to spoken Mandarin in related to 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 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. The course is defined within CEFR intermediate A1 to low A2 level or HSK Level 2.

Course Outcomes

CO1 identify pronunciation of Chinese phrases and simple sentences from audio media or recordings in related to areas of must immediate relevance.

CO2 describe topics related to areas of most immediate relevance using simple Chinese sentences.

CO3 recognize information related to areas of most immediate relevance from simple texts.

CO4 write simple sentences in Hanyu Pinyin related to areas of most immediate relevance.

References

1. Confucius Institute Headquarters (Hanban). HSK Level 2 Test Syllabus. People's Education Press.
2. Confucius Institute Headquarters (Hanban). Official Examination Papers of HSK Level 2 . Higher Education.
3. Yong Ying Mei & Kang Mei Feng (2018), Mandarin for All: Book 2 (Second edition).Penerbit UMP, Pahang, Malaysia
4. Jiang Li Ping (2014), Standard Course HSK 2: Text Book. Beijing Languages & Culture University, Beijing, China
5. Jiang Li Ping (2014), Standard Course HSK 2: Work Book. Beijing Languages & Culture University, Beijing, China
6. Wang Xun (2015), HSK 2 Course Book. Sinolingua Press, China
7. http://digitaldialects.com

Course Code: UHF2121
Course: GEMAN FOR INTERMEDIATE
Pre-requisie: UHF1121 German for Beginners

Synopsis

This course is based on communicative approach. They are expected to communicate accordingly in basic daily situations (topics: living, leisure, employment etc). In addition, the basic elements of German grammar and all four skills (reading, writing, speaking, and listening) are practiced. This course is defined in high CEFR A1 to low A2 level.

Course Outcomes

CO1 apply basic listening skills to extract information from spoken texts in various contexts.

CO2 apply basic reading skills to comprehend information from simple texts.

CO3 communicate using simple phrases on familiar contexts or subjects.

CO4 write a short text using visual supports and other scaffolds.

References

1. Daniela Niebisch, Slyvette Penning-Hiemstra, Franz Specht, Monika Bovermann and Monika Reimann, Schritte international 1 (Kursbuch + Arbeitsbuch) (2013), Hueber Verlag, Ismaning, Germany.
2. Daniela Niebisch et.2010. Schritte international 2 (Kursbuch + Arbeitsbuch), Hueber Verlag, Germany.
3. Monika Reimann.2003. Essential Grammar of German, Max Hueber Verlag, Germany.
4. http://www.hueber.de/schritte-international/
5. http://www.education.vic.gov.au/languagesonline/german/german.htm
6. http://www.dict.cc/

Course Code: UHF2131
Course: JAPANESE FOR INTERMEDIATE
Pre-requisite: UHF1131 Japanese for Beginners

Synopsis

The course aims to expose students to speak Japanese in selected situations which include asking for directions, travelling, family, food and etc. The students will continue to practice the use of 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; listening, speaking, reading and writing. Students will be evaluated on the four language skills namely listening, speaking, reading and writing. By the end of this course, students should be able to attempt the Exam or CEFR low A1 to high A1 level.

Course Outcomes
CO1 identify pronunciation of Japanese syllabus, words and simple sentences from audio media or recording.
CO2 produce simple Japanese sentences about familiar topics.
CO3 utilize basic reading skills to comprehend simple texts.
CO4 write words and simple sentences in Katakana and Hiragana.

References

1. Syahrina Binti Ahmad, (2018). Rina Jap. Let's Practice Japanese!: UMP
2. Syahrina Binti Ahmad & Mohd Iszuani Bin Mohd Hassan, (2012). Yasashi Nihongo 2: UMP
3. Mohd Iszuani Bin Mohd Hassan, (2011). Yasashi Nihongo 1: UMP

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 to 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 vocalized Arabic text. The students will be evaluated based on the four language skills; listening, speaking, reading and writing. The course is defined within CEFR intermediate A1 to high A1 level.

Course Outcomes
CO1 identify pronunciation of phrases and simple sentences from audio media and recordings in areas of most immediate relevance.
CO2 describe topics related to areas of most immediate relevance using simple Arabic sentences.
CO3 identify information related to areas of most immediate relevance from simple texts.
CO4 write simple phrases and sentences in Arabic in areas of most immediate relevance.

References

1. Asar Abdul Karim. Bahasa Arab Untuk Semua, Penerbitan UMP, Kuantan, Pahang, 2008
2. Ahmad Muhammad Mutawalli, Prof. Dr. Ali Ahmad Thalib,Prof. Muhammad Khalaf Yusuf. Taisir Nahu dan Sorf, 2008

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 to areas of most immediate 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 exercises enabling them to build up confidence in reading and writing vocalized Spanish text. The students will be evaluated based on the four language skills; listening, speaking, reading and writing. The course is defined within the CEFR intermediate A1 to high A1 level.

Course Outcomes

CO1 identify pronunciation of phrases and simple sentences from audio media and recordings in areas of most immediate relevance.

CO2 describe topics related to areas of most immediate relevance using simple sentences.

CO3 identify information about familiar subject from straight forward connected texts.

CO4 write simple phrases and sentences in Spanish in areas of most immediate relevance.

References

1. Azlina Mohd Ariffin, (2015) Estudiar Español Conmigo (nivel 2) :UMP
2. Azlina Mohd Ariffin,(2012) Spanish For Intermediate:UMP
3. Gilda Missenberg, (2011). Complete Spansih Grammar: Mc Graw Hill Company
4. Dorothy Richmand,(2009) .Basic Spanish: Mc Graw Hill Company
5. www.amautaspanish.com

Course Code: UHF2271 (not offred)
Course: TURKISH 2
Pre-requisite: UHF1271 Turkish 1

Synopsis

This course covers exercises to develop and expand more complex vocabulary, word classes and sentence construction together with listening, speaking, reading and writing skills in Turkish. In addition, students write short compositions and develop speech skills in conversation. The course enables them to communicate effectively in various situations and contexts using interactive tasks and activities related to real life.

Course Outcomes

CO1 Accurately use common phrases in Turkish.

CO2 Read and understand selected texts.

CO3 Develop and ask questions appropriate to a given listening context.

CO4 Write and explain short compositions in Turkish.

References

1. Tuncay Ozturk & Committee. (2010). Acilim Turkce Ders Kitabi 2 (Turkish Language Textbook 2). Turkey: Caglayan Publication.
2. Tuncay Ozturk & Committee. (2010). Acilim Turkce Calisma Kitabi 2 (Turkish Language Workbook 2). Turkey: Caglayan Publication.
3. Pollard, A.C. & Pollard, D. (2010). *Teach Yourself Complete Turkish.* London: Hodder Headlines.
4. Göksel, A. & Kerslake, C. (2010). *Turkish: An Essential Grammar*. London: Routledge.
5. Kurklu, A. (2008). *Turkish Phrasebook.* Australia: Lonely Planet Publication.
6. Öztopçu, K. (2009). *Elementary Turkish. A Complete Course for Beginners.* Turkey: Sanat Kitabevi.
7. Csato, J & Johanson, L. (2007). *The Turkic Languages.* London: Routledge.
8. Lewis V. Thomas. (2012). *Elementary Turkish.* New York: Dover Publication.
9. Yasar Kuzucu. (2014). *The Delights of Learning Turkish: A self-study course book for learners of Turkish.* Germany: Create Space Independent Publishing Platform.
10. Anonymous. (2008). *Turkish Phrase Book and Dictionary.* London: Berlitz Publishing.
11. http://www.digitaldialects.com/Turkish.htm
12. http://www.hello-world.com/languages.php/?language=Turkish/
13. https://turkce.yee.org.tr/
14. http://www.turkishclass.com/

Course Code: UHF2192
Course: BAHASA MELAYU KOMUNIKASI
Pre-requisite: none

Synopsis

This course aims to expose students to speak Malay Language in related to areas of most immediate relevance (e.g. asking for directions, travelling, foods and drinks). The students will continue to practice the use of Malay vocabulary. 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; listening, speaking, reading and writing. The students will be evaluated based on the four language skills. The course is defined within the CEFR intermediate A1 to high A1.

Course Outcomes

CO1 describe identify pronunciation of Malay Language syllables, words and simple sentences from audio media or recording in related to areas of most immediate relevance.
CO2 identify pronunciation of Malay Language syllables, words and simple sentences from audio media or recording in related to areas of most immediate relevance.
CO3 identify information related to areas of most immediate relevance from simple texts.
CO4 write words and simple sentences in Malay language related to areas of most immediate relevance.

References

1. Juwairiah Osman & Jamilah Bebe Mohamad. (2018). Modul "Malay for Beginners." Penerbit: Universiti Malaysia Pahang, Kuantan.2. Jamilah Bebe Mohamad. (2016). Modul "Malay for Intermediate".
2. Nor Hashimah Jalaluddin, Mardian Shah Omar dan Noor Zilawati Jais. (2007). Bahasa Melayu untuk Penutur Asing. Penerbit: Dewan Bahasa dan Pustaka.

DOUBLE DEGREE PROGRAMME

FACULTY OF INDUSTRIAL MANAGEMENT (FIM)

Course Code: UHG1002
Course: DEUTSCH 1
Pre-requisite: none

Synopsis

This course enables the students understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. Can introduce him/ herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has. The students can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.

Course Outcomes

CO1 visually recognise familiar names, words and very basic phrases on simple notices in most common everyday situations.
CO2 interact in a simple way, if the interlocutor is speaking slowly and clearly and is prepared to help. Students can ask and answer simple questions.
CO3 auditory recognise simple sentences, familiar words that refer to her/himself, own family or concrete things around, when people speak slowly and clearly.
CO4 write a short and simple postcard and fill in a hotel registration form.

References

1. Kalender, Susanne et al.: Schritte Übungsgrammatik, Hueber, München 2010.
2. Dreyer, Schmitt: Lehr-und Übungsbuch der deutschen Grammatik – aktuell, Hueber, München 2009.
3. Gaidosch, Ulrike: Zur Orientierung, Basiswissen Deutschland, 4th Edition, Hueber, München 2010.

Course Code: UHG1012
Course: DEUTSCH 2
Pre-requisite: UHG1002 Deutsch 1

Synopsis

This course enables students to understand simple sentences and frequently used expressions related to daily practices (e.g. very basic personal and family information, shopping, local geography and 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 auditory recognize sentences and frequently used expressions related to areas of most immediate relevance.
CO2 communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters.
CO3 describe in simple terms aspects of their background, immediate environment and matters in areas of immediate need.
CO4 identify specific, predictable information in simple everyday material such as advertisement, manuals, reference lists and timetable.

References

1. Kalender, Susanne et al.: Schritte Übungsgrammatik, Hueber, München 2010.
2. Dreyer, Schmitt: Lehr-und Übungsbuch der deutschen Grammatik – aktuell, Hueber, München 2009.
3. Gaidosch, Ulrike: Zur Orientierung, Basiswissen Deutschland, 4th Edition, Hueber, München 2010.

Course Code: UHG2002
Course: DEUTSCH 3
Pre-requisite: UHG1012 Deutsch 2

Synopsis

This course enables the students to communicate as an Independent User of German Language on level B1 regarding the CEFR. This competence affects all four skills of communication; reading, speaking, listening and writing. He can understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. The student can deal with most situations likely to arise while travelling in an area where the language is spoken. He can produce simple connected text on topics that are familiar or of personal interest. Furthermore, he can describe experiences and events, dreams, hopes and ambitions and briefly give reasons and explanations for opinions and plans.

Course Outcomes

CO1 Conduct grammatical transformation extensively.
CO2 Understand scientific German language spoken at natural pace.
CO3 Extract key information from a text and paraphrase with correct grammar and appropriate lexical items.
CO4 Produce clear, detailed personal texts and clarify a position towards a topic.

References

1. Kalender, Susanne et al.: Schritte Übungsgrammatik, Hueber, München 2010.
2. Dreyer, Schmitt: Lehr-und Übungsbuch der deutschen Grammatik – aktuell, Hueber, München 2009
3. Gaidosch, Ulrike: Zur Orientierung, Basiswissen Deutschland, 4th Edition, Hueber, München 2010

Course Code: UHG2012
Course: DEUTSCH 4
Pre-requisite: UHG2002 Deutsch 3

Synopsis

This course enables the students to communicate as an independent user of German language on B2 level according to the 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 text on a wide range of subjects and explain a viewpoint on a topic giving the advantages and disadvantages of various options. In the last third of the course the basic requirements according to level C1 are taught.

Course Outcomes

CO1 comprehend the main ideas of lecture.
CO2 interact fluently and spontaneously with native speakers.
CO3 produce coherent, detailed text on different and on complex subjects.
CO4 identify the main ideas of complex text on both concrete and abstract topics.

References

1. Kalender, Susanne et al.: Schritte Übungsgrammatik, Hueber, München 2010.
2. Dreyer, Schmitt: Lehr-und Übungsbuch der deutschen Grammatik – aktuell, Hueber, München 2009.
3. Gaidosch, Ulrike: Zur Orientierung, Basiswissen Deutschland, 4th Edition, Hueber, München 2010.

Faculty of Manufacturing & Mechatronic Engineering Technology and Faculty of Mechanical & Automotive Engineering Technology

Course Cod: UHG1003
Course: GEMAN 1
Pre-requisie: 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 auditory recognise simple sentences, familiar words that refer to her/himself, own family or concrete things around, when people speak slowly and clearly.
CO2 interact in a simple way, if the interlocutor is speaking slowly and clearly and is prepared to help.
CO3 write a short simple postcard and fill in a hotel registration form.
CO4 visiually recognize familiar names, words and very basic phrases on simple notices in the most common everyday situations.

References

1. Evans, Puda, Specht Menschen A1 Kursbuch Hueber ISBN-10: 3191019014.
2. Peters, Pude, Reinmann Menschen A1 Arbeitsbuch Hueber ISBN-10: 3191119019.
3. Reinmann Grundstufen-Grammatik für DaF Hueber ISBN-10: 319161575X.
4. Lemcke, Rohrmann Grammatik Intensiver A1 Langenscheidt ISBN-10: 3126063594.
5. hueber www.hueber.de/menschen/hueber Hueber.
6. Stefanie Dengler, Paul Rusch et. al. Netzwerk A1 Kursbuch Klett 978-3-12-606128-5.
7. Stefanie Dengler, Paul Rusch et. al. Netzwerk A1 Arbeitsbuch Klett 978-3-12-606130-8.

Course Code: UHG1013
Course: GERMAN 2
Pre-requisite: UHG1003 German 1

Synopsis

This course enables 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 auditorily recognize sentences and frequently used expressions related to areas of most immediate relevance.
CO2 communicate in simple and routine tasks.
CO3 describe in simple terms aspects of their background, immediate environment.
CO4 identify specific, predictable information in simple everyday material.

References

1. Dengler, S. et al. Netzwerk A2 Kursbuch Langenscheidt/ Klett
2. Dengler, S. et al. Netzwerk A2 Arbeitsbuch Langenscheidt/ Klett

3. Buscha, A., Szita, S. Begegnungen Deutsch als Fremdsprache A2+: Integriertes Kurs- und Arbeitsbuch.

Course Code: UHG1016
Course: INTENSIVE GERMAN 1
Pre-requisite: UHG1003 German 1 & UHG1013 German

Synopsis

This course is designed as 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 at 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, expectations on B1 level.

Course Outcomes

CO1 recognize most auditive input, when near-standard register is used in everyday situations.
CO2 communicate in areas of daily relevance, e.g. personal information, daily routine, work, spare time, future plans.
CO3 compose brief coherent texts about most familiar matters as well as events, experiences and intentions.
CO4 perceive the main points of written input in standard register related to areas of most immediate relevance.

References

1. Aspekte neu B1 plus: Mittelstufe Deutsch. Lehr-und Arbeitsbush mit Audio-CD, Teil 1 (Aspekte neu / Mittelstufe Deutsch)
2. Prüfungstraining DaF: B1 - Zertifikat Deutsch / telc Deutsch B1: Übungsbuch mit CD und CD-ROM Taschenbuch – 1. August 2013
3. Schritte plus Neu 5: Deutsch als Zweitsprache für Alltag und Beruf / Kursbuch + Arbeitsbuch + CD zum Arbeitsbuch Sondereinband – 1. August 2017

Course Code: UHG2003
Course: GERMAN 3
Pre-requisite: UHG1013 German 2

Synopsis

This course enables 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 skilful enough to produce clear, well-structured text on both abstract and concrete topics, equal to a B2.1 level.

Course Outcomes

CO1 auditorily comprehend stratightforward factual information about common every day or job related topics.
CO2 engage in discussions about experiences and events, dreams and ambitions.
CO3 write simple connected text on topics that are familiar or of personal interest.
CO4 identify the main points and supporting details of standard input on familiar matters regularly encountered in work, school, leisure and others.

References

1. Hueber Verlag www.hueber.de Hueber
2. Klett Verlag www.klett.de Klett
3. Ute Koithan, u. a Aspekte neu B2 Teil 1 Klett
4. Schubert Verlag http://www.schubert-verlag.de/aufgaben

5. Schubert Verlag http://www.schubert-verlag.de/aufgaben/index.htam Schubert

Course Code: UHG2013
Course: GERMAN 4
Pre-requisite: UHG2003 German 3

Synopsis

This course enables the students to communicate as an independent user of German language on B2 level according to the 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 text on a wide range of subjects and explain a viewpoint on a topic giving the advantages and disadvantages of various options.

Course Outcomes

CO1 comprehend the main ideas of lecture or/and interview on both concrete and abstract topics, including technical discussions in specific fields.
CO2 interact fluently, accurately and effectively with native speakers without strain for either party.
CO3 produce coherent, detailed text on different subjects and justify a viewpoint on a topical issue, giving the advantages and disadvantages of various options.
CO4 identify the main ideas of complex text on both concrete and abstract topics, including technical specialized tests.

References

1. Ute Koithan, u. a Aspekte neu B2 Teil 2 Klett
2. Hueber Verlag www.hueber.de Hueber
3. Klett Verlag www.klett.de Klett
4. Schubert Verlag http://www.schubert-verlag.de/aufgaben
5. Schubert Verlag http://www.schubert-verlag.de/aufgaben/index.htam Schubert

Course Code: UHG2016
Course: INTENSIVE GERMAN 2
Pre-requisite: UHG2003 German 3 & UHG2013 German 4

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 speaker quite possible without strain for either party. Students can produce clear, detailed texts on a wide range of subjects and explain a viewpoint on topic, giving advantages and disadvantages of various opinions

Course Outcomes

CO1 understand the main ideas of complex text on both concrete and abstract topics.
CO2 comprehend detailed instructions and interviews on both concrete and abstract topics.
CO3 produce clear, detailed texts on a wide range of subjects.
CO4 debate fluently and spontaneously without strain for either party.

References

1. Erkundungen Deutsch als Fremdsprache B2: Integriertes Kurs- und Arbeitsbuch Taschenbuch – 1. Oktober 2008.
2. Mit Erfolg zu telc Deutsch B2: Zertifikat Deutsch Plus. Testbuch + Audio-CD Taschenbuch – 13. September 2010.

ELECTIVE COURSES

Course Code: UHE3022

Course: CRITICALTHINKING THROUGH LITERATURE
Pre-requisite: none

Synopsis

This course aims to use literature as a subject matter that will be explored through the use of various activities which engages 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 high B2 to low C1 level.

Course Outcomes

CO1 Interpret a poem critically using relevant content and appropriate language.
CO2 Write a short story incorporating critical understanding of literary elements.
CO3 deliver a critical analysis of the history of music.
CO4 Produce a radio drama incorporating critical understanding of literary elements.

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. (2nd 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 instil 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 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 appropriate content.
CO2 Analyse and construct a creative piece of writing based on a picture/situation using accurate language and appropriate content.
CO3 Create an original short story using accurate figurative language and appropriate content.
CO4 Produce a storyboard, radio drama script, radio drama and a reflection report.

References

1. Bair, A. L. (2019). Bloging 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. Cook, T. (2020). Writing Audio Drama: Radio, Film, Theatre and Other Media. Taylor & Francis.
4. Falcon, L. A. (2020) Write Your Short Story: 101 Ideas for Short Story Writing.
5. Goodman, R. (2017). The Soul of Creative Writing. Routledg.
6. 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 level.

Course Outcomes

CO1 Identify elements of writing mechanics in English language according to selected writing conventions.
CO2 Identify and analyse the use of writing mechanics in English language at sentence and paragraph levels.
C03 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 7th 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. 11th 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 three types of public speaking, namely informative, persuasive and impromptu 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 Produce a video presentation to introduce themselves by using effective delivery strategies and appropriate language style.
CO2 Demonstrate understanding of the fundamentals of public speaking.
CO3 Write original informative and persuasive speech outlines using appropriate language, correct format and relevant content.
CO4 Present different types of speeches by using effective delivery strategies, appropriate language and relevant content.

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. Gallo, C. (2019). Talk Like TED: The 9 Public Speaking Secrets of the World's Top Minds. Pan Macmillan.

4. Fujishin, R. (2016). The Natural Speaker. Routledge.
5. Sprague, J., Stuart, D., & Bodary, D. (2018). The Speaker's Handbook. Cengage Learning.
6. Dwyer, K.K. (2020). I Conquer Speech Anxiety: A Workbook to Help You Overcome Your Nervousness About Public Speaking. Kld Books, Inc.

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 course is defined within the CEFR B1 to high B2 level.

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 a title, abstract, references and a work schedule of project based proposal.
CO4 defend a complete proposal via oral presentation using appropriate skills, language and delivery styles.

References

1. Birley, G., & Moreland, N. (2014). A practical guide to academic research. Routledge.
2. Hafizoah Kassim, Noor Raha Mohd Radzuan, Nor Yazi Khamis, Zarina Mohd Ali & Zuraina Ali. (2014). No Plagiarism!. Penerbit UMP.
3. McGregor, S. L. (2017). Understanding and evaluating research: A critical guide. SAGE Publicatios.
4. Punch, K. (2000). Developing effective research proposals. Sage.
5. Style, B. A. (2020). APA 7th 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 play. 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 demonstrate the application of a self-reflection plan 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.