

**CURRICULUM STRUCTURE
DIPLOMA IN MECHANICAL ENGINEERING**

YEAR	1			2		
COURSES	UHC2022 Penghayatan Etika dan Peradaban	DRM1113 Engineering Drawing & CAD	DCI1103/DRM1523 Computer Programming	DRM1223 Dynamics	DRM2243 Solid Mechanics	DRM2910 Industrial Training
	UHC1012 Falsafah dan Isu Semasa	DRM1213 Engineering Materials	DRM1413 Manufacturing Technology	DRM2313 Fluid Mechanics	DRM2133 Mechanical Design	
	DUM1113 Basic Mathematics	DRM1223 Statics	DRM1513 Electrical and Electronic Technology	DRM2423 Hydraulics & Pneumatics Technology	DRM2323 Thermodynamics	
	UHC1032 KIAR	DRM1711 Mechanical Technology Lab 1	DRM1721 Mechanical Technology Lab 2	DRM2122 Industrial Design	DRM2443 CNC Technology	
		DRM1613 Metrology	DRM2622 Mechanical Measurement & Instrumentation	DRM2432 Occupational Safety & Health	DRM2814 Final Year Project	
		DUF1113 Physics	DUM1123 Calculus	UGE1002 Entrepreneurship	DUM2413 Statistic and Probability	
		UHL2442 Essential English	UHL2412 English for Academic Communication	UHL2432 English for Professional Communication		
		UQA1002 Co-curriculum				
TOTAL CREDIT PER SEMESTER	9	20	17	17	19	10
92	OVERALL TOTAL CREDIT FOR GRADUATION					

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO 1	Graduates will have essential knowledge in improving productivity in mechanical engineering, manufacturing and service companies effectively
PEO 2	Graduates will have competencies for career development or continuing study to higher level
PEO 3	Graduates engage in lifelong learning and wealth development professionally and ethically.

PROGRAMME LEARNING OUTCOMES (PLO)	
PO1	Apply knowledge of applied mathematics, applied science, engineering fundamentals and an engineering specialization as specifies in DK1 to DK4 respectively to wide practical procedures and practices
PO2	Identify and analyse well-defined engineering problems reaching substantiated conclusion using codified methods of analysis specific to their field of activity (DK1 to DK4)
PO3	Design solutions for well defined technical problems and assist with the design systems, components or processes to meet specified needs with appropriate considerations for public health and safety, cultural, societal and environmental consideration (DK5)
PO4	Conduct investigations of well-defined problems; locate and search relevant codes and catalogs, conduct standard tests and measurements
PO5	Apply appropriate techniques, resources and modern engineering and IT tools to well-defined engineering problems, with an awareness of the limitations (DK6)
PO6	Demonstrate knowledge of the societal, health, safety, legal ad cultural issues and the consequent responsibilities relevant to engineering technician practice and solutions to well-defined engineering problems (DK7)
PO7	Understand and evaluate the sustainability and impact of engineering technician work in the solution of well-defined engineering problems in societal and environmental context
PO8	Understand and commit to professional ethics and responsibilities and norms of technician practice.
PO9	Function effectively as an individual, and as a member in diverse technical teams
PO10	Communicate effectively on well-defined engineering activities with the engineering community and with society at large, by being able to comprehend the work of others, document their own work, and give and receive clear instructions
PO11	Demonstrate knowledge and understanding of engineering management principles and apply these to one's own work, as a member or leader in a technical team and to manage projects in multidisciplinary environments;
PO12	Recognise the need for, and have the ability to engage in independent updating in the context of specialised technical knowledge

COURSE SYNOPSIS DIPLOMA IN MECHANICAL ENGINEERING

DCI 1103/DRM1523
Computer Programming
Credit Hour: 3

Synopsis

This subject aims to introduce the fundamental element and feasibilities of the computer programming to solve identified problems. The contents emphasis not only on the theoretical knowledge of programming but also the practical implementation in solving applications problem. Students will learn basic structure of computer programming including variables and data types, input and output instruction, statements, functions, arrays, string, pointers and files operations. Students will be taught on developing a program to solve general engineering problems, mathematical equations as well as displaying the data via 2D and/or 3D graphs.

Course Learning Outcomes

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

CO1: Demonstrate the principles and concept of computer programming to solve problems with utilization of mathematics & sciences knowledge.

CO2: Solve scientific or engineering problem using numerical knowledge with computer programming.

CO3: Illustrate solutions using appropriate digital tools and platform

DRM1113
Engineering Drawing & CAD
Credit Hour: 3

Synopsis

This subject is design to teach engineering drawing to the student using drawing tools such as free hand drawing, instrument drawing & Computer Aided Design

Drawing (CAD) software. This will include from beginning to intermediate level of CAD. Student should be able to draw 2D as well as 3D drawing standard upon completing this course.

Course Learning Outcomes

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

CO1: Explain knowledge in engineering drawing principles, standard practice using drawing tools, different types of views and blueprint of working drawing. CO2: Apply knowledge and techniques to create 2D standard drawing related to engineering design by using CAD software

CO3: Apply knowledge and techniques to create standard drawing related to design engineering by using 3D approaches in CAD software.

CO4: Perform 3D CAD project using related knowledge and effectively explain the related work in written form.

DRM1513
Electrical & Electronic Technology
Credit Hour: 3

Synopsis

This course introduces fundamental of electric circuit, circuit network analysis, inductance and capacitance. The electronics technology involved with basic understanding of usage and application of semiconductor devices: diodes, transistor, and digital logic circuits.

Course Learning Outcomes

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

CO1: Apply knowledge of basic electrical circuit and semiconductor devices in mechanical engineering.

CO2: Construct electrical circuit based on basic electrical and electronic knowledge.

CO3: Solve mechanical engineering problem involving basic electrical and electronic.

DRM1213
Engineering Materials
Credit Hour: 3

Synopsis

This course introduces the engineering materials application, atomic bonding, crystal structure, mechanical and physical properties, microstructure, phase diagram, ferrous and non-ferrous alloys, polymer and advanced materials.

Course Learning Outcomes

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

CO1: Explain the classification of material, materials' atomic bonding and crystal structure and the application of ferrous and non-ferrous alloys, polymeric material and advanced material.

CO2: Describe the mechanical and physical properties of engineering material, metal alloys microstructure, phase diagram, strengthening mechanism and heat treatment process.

CO3: Demonstrate mechanical testing to investigate the mechanical properties of engineering material.

CO4: Demonstrate teamwork to manage the mechanical testing throughout the group lab.

DRM1223
Statics
Credit Hour: 3

Synopsis

This course is an introduction to solving engineering static problems involving force vector, equilibrium of particle and rigid body in structures, frame and machines, friction effect on rigid body equilibrium, centroids, center of gravity and moment of inertia.

Course Learning Outcomes

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

CO1: Solve the resultant of coplanar forces

in scalar and vector notation.
CO2: Analyse the equilibrium of particle and rigid body problem.
CO3: Evaluate the equilibrium condition for structural and friction problem.
CO4: Determine the centroid and moment of inertia of an area.

DRM1711
Mechanical Technology Laboratory 1

Synopsis

This course introduces students with safe working habits, reading blueprints, identification, care and use basic measuring instruments, layout methods & basic hand tools. Emphasis is placed on operation of drill press, lathe, pedestal grinder and grinding operations..

Course Learning Outcomes

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

CO1: Apply bench work in a manner of safety and regulation for drilling operation, basic turning operation and grinding process.

CO2: Demonstrate teamwork during the lab session to complete the project.

DRM1721
Mechanical Technology Laboratory 2
Credit Hour: 1

Synopsis

The course provides students hands-on experience of milling operations using conventional milling machine, welding operations using different types of welding equipments including electrode, MIG, TIG and spot weld and basic application of sheet metal fabrication.

Course Learning Outcomes

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

CO1: Apply basic application of various

basic conventional milling operations, sheet metal fabrication and joining using welding operations.

CO2: Perform the project using related tools and summarize it in a report form.

DRM1613
Metrology
Credit Hour: 3

Synopsis

This course covers the engineering measuring instruments such as micrometer, Vernier caliper, mechanical dial indicator, gauge block, surface plate, instruments of testing angles and gauges. Additionally, we will cover the principle of surface metrology and roundness measurement. Lastly, we will learn the relationship between drawing dimensions and the measurement parts, aspect of accuracy, precision and measurement errors.

Course Learning Outcomes

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

CO1: Apply the fundamental of metrology, measurement errors and basic inspection by utilizing various methods and techniques.

CO2: Demonstrate linear and angular measurements, principles of surface metrology and inspection by various measurement instruments.

CO3: Demonstrate various measurement methods utilized for project outcome using related communication strategies and skill.

DRM2243
Solid Mechanics
Credit Hour: 3

Synopsis

This course introduces the concept of stress and strain under axial loading, torsion, pure bending, and analysis and design of beam for bending.

Course Learning Outcomes

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

CO1: Compute the stresses and strains in loadbearing structures and structural members subjected to axial loads.

CO2: Solve the circular shafts subjected to twisting couples and torque.

CO3: Analyze the stresses in beam subjected to pure bending.

CO4: Design the beams subjected to transverse loading by using shear force and bending moment diagram.

DRM2622
Mechanical Measurement and Instrumentation
Credit Hour: 2

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').

Course Learning Outcomes

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

CO1: Implement the basic element in mechanical measurement and instrumentation system; and fundamental of selected important transducers.

CO2: Demonstrate the appropriate signal analysis in measuring analogue signal from transducers.

CO3: Develop virtual instrumentation system using DasyLab Software to acquire data from transducer time and/or frequency domain

DRM1233
Dynamics
Credit Hour: 3

Synopsis

The course introduces fundamental elements in the discipline of dynamics with the emphasis on the motion of particles. Both kinematics and kinetics analysis will be covered encompassing the myriad classifications of motions in rectilinear and curvilinear trajectory. The principles of motions will be utilised to determine the variations in dynamical quantities, namely position, velocity and acceleration along the evolving time steps. Particle kinetics will deal with the analysis of the same quantities as viewed by the three techniques; 1) Force and acceleration as explicated by Newton's law, 2) The principle of work and energy as well as 3) Impulse and momentum analysis in particle motions.

Course Learning Outcomes

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

CO1: Analyse kinematics of particles problems.

CO2: Solve kinetics of particles problems utilising the Newton's Second Law of Motion

CO3: Analyse kinetics of particles problems utilising the work-energy principle

CO4: Solve the kinetics of particles problems utilising the impulse-momentum principle

DRM2313
Fluid Mechanics
Credit Hour: 3

Synopsis

This course introduces the principal concepts and methods of fluid behaviour. Comprehension of fluid statics, fluid in motion and flow in pipes. Development of the problem-solving skills is essential to good engineering practice of fluid mechanics in practical application. & pumping.

Course Learning Outcomes

By the end of semester, students should be

able to:

CO1: Solve problems related to the basic properties, fluid in static conditions, pressure, and buoyancy concept.

CO2: Apply fluid in motion fundamental and the basic of flow concept through parameters related to a moving fluid.

CO3: Solve flow in pipes problems due to friction effect, fittings in a piping system and losses of pressure head.

CO4: Communicate effectively among the project members to finish the task.

DRM2323
Thermodynamics
Credit Hour: 3

Synopsis

This course includes a study of properties of a system, properties of pure substance, first law and second law of thermodynamics and entropy

Course Learning Outcomes

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

CO1: Analyse the typical problems related to the basic concepts of thermodynamics.

CO2: Investigate the properties of pure substances to the typical problems using related property tables and charts.

CO3: Solve the problems involving the First and Second Law of Thermodynamics System.

CO4: Display energy efficient utilization and environmental impact through Thermodynamics mini project

DRM2122
Industrial Design
Credit Hour: 2

Synopsis

This course 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 team.

Course Learning Outcomes

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

CO1: Solve the technical contradictions using the inventive principles triggered from the Altshuller Matrix (TRIZ method) through brainstorming techniques, design concept generation and screening.

CO2: Construct a low fidelity prototype to demonstrate the idea concept using the creative toolkits or computer aided design software.

CO3: Explain the design ideas or design concepts by applying management principles and related techniques/method.

DRM1413
Manufacturing Technology
Credit Hour: 3

Synopsis

This course introduces the student to various types of manufacturing processes used for converting raw material into finished products. This course will cover basic principles in metal casting processes, plastics processes, metal and sheet metal forming processes, powder metallurgy processes, materials removal processes, rapid prototyping and joining processes. Student will construct and present a process flow to manufacture a conceptual product.

Course Learning Outcomes

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

CO1: Explain different types of manufacturing processes

CO2: Apply different types of

manufacturing processes

CO3: Construct solution for technical problem related to manufacturing processes using a conceptual product.

DRM2432
Occupational Safety & Health
Credit Hour: 2

Synopsis

This course introduces OSH in Malaysia, identification, types and inspection of industrial hazard, analysis and control of industrial hazard, mechanical hazard, chemical hazard, physical hazard, psychosocial hazard, industrial hygiene and diseases, accident causation phenomenon, accident investigation and analysis, managing safety and health, and industrial safety and health regulation.

Course Learning Outcomes

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

CO1: Demonstrate the OSHA regulation and implementation in Malaysia

CO2: Explain the industrial hazards and industrial hygiene

CO3: Analyse the accident phenomenon

DRM2423
Hydraulics & Pneumatics Technology
Credit Hour: 3

Synopsis

This course introduces basic fluid power mainly using hydraulic and pneumatic systems. The hydraulic and pneumatic system that consist of main component such as actuators, sensors, valves and control system. This course also introduces the basic design, analysis and simulation method of hydraulic and pneumatic system. Electromechanical control and programmable logic control of hydraulic/pneumatic system are introduce to enhance the hydraulic and pneumatic system design.

Course Learning Outcomes

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

CO1: Analyse the Hydraulic/ Pneumatic circuit's problems using manual operated system and components.

CO2: Analyse Hydraulic/ Pneumatic circuits using electro and Programmable Logic Control (PLC) system.

CO3: Construct the circuit complex of Hydraulic and Pneumatic System using related software and hardware.

CO4: Communicate effectively on the solution of circuits' problem of Hydraulic and Pneumatic systems.

DRM2443

CNC Technology

Credit Hour: 3

Synopsis

This course introduces the student to modern manufacturing processes which focused on CNC machining technology. This course will teach manual CNC programming and simulation using CNC simulator. This course will also cover troubleshooting for common programming errors. Student will construct a CNC program to manufacture a workpiece according to a technical engineering drawing.

Course Learning Outcomes

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

CO1: Understand and apply the fundamental and application of CNC programming (G & M codes) that tells a CNC milling machine where-and how-to move either linear or circular motion including canned cycle (for drilling, tapping and etc.)

CO2: Understand and apply the fundamental and application of CNC programming (G & M codes) that tells a CNC lathe machine where-and how-to move either linear or circular motion including canned cycle (for drilling, tapping

and etc.)

CO3: Apply the CAD/CAM software to manage the CNC machining process from design to fabrication including the CNC machine setup (workpiece and tool setup) throughout CNC fabrication project.

CO4: Demonstrate teamwork to manage the CNC machining process from design to fabrication including the CNC machine setup (workpiece and tool setup) throughout CNC fabrication group project.

DRM2133

Mechanical Design

Credit Hour: 3

Synopsis

This course introduces simple design process of machine components for static and dynamic loading. Machine elements design including screws, bolts, nuts, welded joints, springs and shafts.

Course Learning Outcomes

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

CO1: Analyse static failure on structures and fatigue failure on shafts

CO2: Solve the problem related to the helical compression springs

CO3: Investigate the non-permanent joints including bolts, nuts and screws using appropriate standard and table.

CO4: Analyse the welding in torsion and bending using related resources

DRM2814

Final Year Project

Credit Hour: 4

Synopsis

This course involves the project assignment to the students concerning selected topics related to the mechanical engineering. The technical project requires a particular design of appropriate equipment/system, development of the manufacturing process, testing and analysis of the system or equipment,

preparation and presentation of the project report.

Course Learning Outcomes

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

CO1: Manage a project based on knowledge of engineering and current practices of engineering tools.

CO2: Organize techniques for literature review and utilise the gathered information towards of accomplishment of the project.

CO3: Perform entrepreneurship knowledge in managing projects by considering cost effectiveness, practicality or marketability.

CO4: Conduct the project task through ethical and professional practices in engineering.

CO5: Manage the usage of environmental friendly resources and materials during fabrication. CO6: Display the outcome in oral presentation and written report according to UMP thesis format

DRM2910
Industrial Training
Credit Hour: 10

Synopsis

This training expose students to experience, practice and apply professional skills in mechanical

engineering field. The exposure will helps to produce an excellent, responsible and good attitude of mechanical engineering graduate. Soon, will helps to improve and develop the country especially in mechanical engineering field.

Course Learning Outcomes

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

CO1: Analyse and solve the industrial problems through the planning, design, construction and management of the projects.

CO2: Investigate the industry's problem by collecting relevant data and resources.

CO3: Identify and solve the industrial problem using available or learnt modern tools such as CAD, CNC machine etc.

CO4: Display solution for industrial problem that has impact on environment and engineering sustainability.

CO5: Identify the company or department structure and recognize the responsibilities of specific post in the organization.

CO6: Explain the industrial training at industry in a complete report by end of the industrial training program.

CO7: Organize/manage a small group of people for special task/assignment. Build strong network when dealing with colleagues in industry.

CO8: Build strong network when dealing with colleagues in industry

**CURRICULUM STRUCTURE
BACHELOR OF TECHNOLOGY IN AUTOMOTIVE WITH HONOURS**

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEM	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	SM	FIRST
COURSES	BVA1014 Automotive Industry & Technology	BVA1043 Shopfloor Supervision	BVA2013 Project Management	BVA2034 Powertrain System Service	BVA3013 Automotive Legislation	BVA3056 Quality Management	BVA3326 Final Year Project 2	BVA3412 Industrial Training
	BVA1023 Automotive Drafting	BVA1054 Automotive Component Design & Assembly	BVA2024 Autotronic System Service	BVA2044 Capstone Technopreneurship 1	BVA3024 Capstone Technopreneurship 2	BVA3314 Final Year Project 1		
	BVA1034 Automotive Workshop Practice	BVA1064 Automotive Component Fabrication	UHF1111 Mandarin for Beginner	BVA3043 Asset & Inventory Management	BVA3032 Vehicle Marketing			
	UGE2022 Technopreneurshi p	UQA2002 Kokurikulum	BVA2**41 Elective 1	UHF2111 Mandarin for Intermediate	BVA3073 Risk Management			
	UHC1032 KIAR	UHC2022 Penghayatan Etika dan Peradaban	BVA2**42 Elective 2	BVA2**43 Elective 3	BVA3**41 Elective 5			
	UHC1012 Falsafah dan Isu Semasa	UHL2452 English for Vocational		BVA2**44 Elective 4	BVA3**42 Elective 6			
	UHL2442 Essential English							
TOTAL CREDIT	19	17	16	20	20	10	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 Modelling	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 FOR DEGREE
TECHNOLOGY PROGRAMME
2024/2025**

AUTOMOTIVE TECHNOLOGY

BVA1014

Automotive Industry & Technology

Credit Hour: 4

Prerequisite: None

Synopsis

This course covers selected current technology in the automotive vehicle and in the automotive industry. The objective of the course is to expose on the technology utilized in the automotive industry, and to show the current and future technology in the automotive vehicle. The first part of the course covers brief history of the automotive industry, advanced driver assistance systems (ADAS), electrification in the vehicles and alternative fuels. Later in the second part, the course reveal three major component in the automotive industry which is product development flow, manufacturing and finally the distribution of the vehicles. The course will assess the cognitive, psychomotor and affective domain of the students.

Course Learning Outcomes

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

CLO1: Discover the current technology in automotive (C3, PLO1)

CLO2: Build skills on current systems used and their role in automotive industry (P3, PL02)

CLO3: Explain the opportunities, and challenges in the automotive industry (A3, PL04)

BVA1023

Automotive Drafting

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduced method that is used to generate the 2D drawing and how to apply drawing dimensions, symbols, and others. The course objectives are to apply knowledge and comprehension in generating 2D drafting for technical communication purpose, and construct 2D view and generate 2D drafting with proper dimensions, tolerances and symbols, and prepare automotive components drafting for effective technical communications. The course covers drawing view preparation, Limit, Fit and Tolerances, Geometric dimensioning & tolerancing, Surface Texture and Welding Symbol, Working drawing, Introduction of 2D drafting using CAD, Drafting with CAD, Draft document preparation, and Final Project. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

Course Learning Outcomes

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

CLO1: Module 1: Apply knowledge and comprehension in generating 2D drafting for technical communication purpose (C3, PLO1)

CLO2: Module 2: Construct 2D view and generate 2D drafting with proper dimensions, tolerances and symbols (P5, PLO2)

CLO3: Module 3: Prepare automotive components drafting for effective technical communications (A4, PLO4)

BVA1034

Automotive Workshop Practice

Credit Hour: 4

Prerequisite: None

Synopsis

This course aims to expose students to the function of major automotive system. This course objectives are to Classify the system of automotive workshop, display the correct automotive workshop practice, and to demonstrate good workshop practice according to standard occupational safety and health. The course

covers the designation and responsibilities in Automotive Workshop, workshop compliance to rules and regulations of 4S centre, automotive workshop layouts, automotive workshop safety and 5S, automotive tools and equipments, automotive measuring system and measuring tools, automotive fasteners, gaskets and sealants, Vehicle identification number, Automotive service procedure, Pre-servicing preparation, Post-servicing inspection, Aftersales services and customer care, and workshop waste management . The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

Course Learning Outcomes

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

CLO1: Classify the system of automotive workshop (C3, PLO1)

CLO2: Display the correct automotive workshop practice (P3, PLO2)

CLO3: Demonstrate good workshop practice according to standard occupational safety and health. (A3, PLO5)

BVA1043

Shopfloor Supervision

Credit Hour: 4

Prerequisite: None

Synopsis

Shop Floor Supervision reviews the skills and techniques required to analyze manufacturing system and to design improved methods and layouts. The course objectives are to determine the philosophy and foundation of shopfloor supervision, to assemble the shopfloor operation using related tools, explain a good leadership and teamwork in shopfloor supervision. The course covers Key Performance Indicator (KPI) & Supervisor Behaviour, 5s and Kaizen, Safety Education & Skill Training, Job Allocation, Capacity planning and Standardized Work, Quality Assurance, Preventive Maintenance & Total Productive Maintenance (TPM), Lean Manufacturing Tools, and Project Oriented

Problem Based Learning (POPBL) Consultation. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

Course Learning Outcomes

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

CLO1: Explain the philosophy and foundation of shopfloor supervision. (C2, PLO1)

CLO2: Execute the shopfloor operation using related tools. (P2, PLO2)

CLO3: Explain a good leadership and teamwork in shopfloor supervision (A4, PLO9)

BVA1054

Automotive Component Design & Assembly

Credit Hour: 4

Prerequisite: None

Synopsis

This course introduced method that is used to construct the 2D and 3D Computer Aided Drawing (CAD) data. The course objectives are to apply knowledge and comprehension in constructing 2D sketch data for technical communication purpose, build using proper features in constructing 3D CAD data based on the actual manufacturing component design, prepare drafting of automotive components design and assembly for effective technical communications. The course covers Introduction to 3D cad, 2D Sketch, 2D Sketch manipulation, 3D Features, Assembly, Drafting and Project. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

Course Learning Outcomes

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

CLO1: Module 1: Apply knowledge and comprehension in constructing 2D sketch

data for technical communication
CLO2: Module 2: Build using proper features in constructing 3D CAD data based on the actual manufacturing component design (P5, PLO2)
CLO3: Module 3: Prepare drafting of automotive components design and assembly for effective technical communications (A4, PLO4)

BVA1064
Automotive Component Fabrication
Credit Hour: 4
Prerequisite: None

Synopsis

The course intended to teach students to analyze the fundamental concepts of manufacturing processes in automotive, construct various skills of manufacturing techniques as an individual or a group, and comply with the manufacturing process according to detail drawing or Standard Operating Procedure (SOP). The course covers overview of manufacturing process, sheet metal shearing process, joining process, finishing process, machining process, and metal casting. The topic will assess the cognitive, psychomotor and affective domain of teaching and learning.

Course Learning Outcomes

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

CLO1: Analyse the fundamental concepts of manufacturing processes in automotive (C4, PLO1)
CLO2: Construct various skills of manufacturing techniques as an individual or a group. (P5, PLO2)
CLO3: Comply the manufacturing process according to detail drawing or Standard Operating Procedure (SOP) (A2, PLO8)

BVA2013
Project Management
Credit Hour: 3
Prerequisite: None

Synopsis

This subject focuses on the principles of project management including the importance and interrelationship of all its components. The course objectives are to determine the core concepts and principles, functions, and process in project management, organise project proposal until closing out the project, and demonstrate the capability to function effectively as members or group leader in achieving project goal. The course covers introduction: Project Management And Integration, Project Proposal, Team Planning & Project Start-Up, Organizing The Individual Project Office & Project Team, Planning & Initiating Projects, Authorizing & Controlling The Work, Schedule & Cost, Leadership skill, Reducing project duration, Managing risk and outsourcing, and Evaluating, Directing & Closing Out The Project. The topic will assess the cognitive, psychomotor and affective domain of teaching and learning

Course Learning Outcomes

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

CLO1: Determine the core concepts and principles, functions, and process in project management (C4, PLO1)
CLO2: Organise project proposal until closing out the project (A4, PLO4)
CLO3: Demonstrate the capability to function effectively as members or group leader in achieving project goal. (A4, PLO9)

BVA2024
Autotronic System Service
Credit Hour: 4
Prerequisite: None

Synopsis

This course started with historical review on the electronic utilization in automotive industry and electronic fundamentals as foundation. Next, this course will focus on the design and operation of automotive

electrical and electronic systems in various application, especially in engine, emission, safety, communication and driveline control. Meanwhile, this course also stress on the significant of electrical system and circuits, which is importantly inter-related with automotive electronic system. Some of the key electrical system that will be included are battery construction & maintenance, charging & starting system design & services, electronic ignition system and lighting system. The course will assess the cognitive and affective domain of teaching and learning.

Course Learning Outcomes

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

CLO1: Analyse the design and construction of electrical & electronics system in automotive (C4, PLO1)

CLO2: Display the functions and operations of automotive electrical and electronic systems. (P5, PLO2)

CLO3: Identify electrical and electronic system for automotive electrification. (PLO4, A4)

BVA2034
Powertrain System Service
Credit Hour: 4
Prerequisite: None

Synopsis

This subject focuses on powertrain service and maintenance for light vehicle unit. The objective of the study are to distinguish powertrain subsystem and detail functions, Demonstrate the knowledge and skills of vehicle diagnose, service and maintenance, and Adhere to the powertrain diagnose, service and maintenance based on standard operating procedure. The course covers various topics such as engine lubrication system, engine cooling system, fuel injection system, ignition system, engine combustion chamber, and intake and exhaust system. The course will assess the cognitive, psychomotor and affective domain of teaching.

Course Learning Outcomes

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

CLO1: Distinguish powertrain subsystem and detail functions (PLO1, C4)

CLO2: Demonstrate the knowledge and skills of vehicle diagnose, service and maintenance (PLO2, P5)

CLO3: Adhere to the powertrain diagnose, service and maintenance based on standard operating procedure (PLO7,

BVA2044
Capstone Technopreneurship 1
Credit Hour: 4
Prerequisite: Technopreneurship

Synopsis

This course introduces students to the knowledge and skills in strategic planning, fundraising, negotiations, organization, and financial decision making. The course objectives are that students may sufficiently and efficiently start their enterprises through progressive stages of development and ultimately achieve optimum financial success with a highly profitable exit. The course prompts students to think finance and strategy in a holistic manner and within the appropriate context by learning from experts and listening to talks from successful business owners about various stages typical entrepreneurs face from incubation to exit. The course will assess the affective domain of the student.

Course Learning Outcomes

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

CLO1: Develop creativity, innovative mindset, courage to take calculated risks and actions upon opportunities as the foundation of entrepreneurship culture in mobility related business (PLO6, A2, Lifelong Learning & Information Management)

CLO2: Explain flexible and facilitative

governance, regulation and funding to facilitate exploration into entrepreneurship (SME) (PLO7, A4, Technopreneurship & Management Skills)

CLO3: Propose (Pitch) ideas on creating high-growth enterprises and the use of latest technology in marketing (PLO9, A5, Teamwork & Leadership)

BVA3024

Capstone Technopreneurship 2

Credit Hour: 4

Prerequisite: Technopreneurship
Capstone 1

Synopsis

This course introduces students to the technology and skills required of future entrepreneur to achieve breakout performance as technology and business have joined forces to co-create value, hence technology and skills have conspired to require a new kind of entrepreneurial mindset. The course objectives are that students are expected to acquire knowledge and skills that will enable them to gain a competitive edge and exceed goals in business. The course offers a non-technical, broadoverview of new technologies that are impacting companies across multiple industries stressing on advancement in technologies which is an essential topics for business owners, managers and executives who seek to understand the technologies that drive business transformation and how to implement them to drive transformation in their organisation. The course will assess the affective domain of the student.

Course Learning Outcomes

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

CLO1: Explain emerging technologies and their business applications (PLO6, A4, Lifelong Learning and Information Management)

CLO2: Formulate new business solutions that are enabled by modern tools and technologies (PLO7, A4,

Technopreneurship and Management Skills)

CLO3: Propose innovations that build on existing business infrastructure that are enabled by advances in technologies (PLO4, A5, Communication Skills)

BVA3032

Vehicle Marketing

Credit Hour: 2

Prerequisite: None

Synopsis

This course introduces students to the fundamentals of vehicle marketing and how they may be applied to entrepreneur technologies. The course objectives are to explain how to use technology into strategic marketing and analyze the various marketing management activities and their roles. The course covers analysing marketing environment, financial strategy, competitive strategy and analysis, vehicle's import regulation, and marketing strategy. The course will assess the cognitive and affective domain of the teaching and learning

Course Learning Outcomes

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

CLO1: Identify the technology relates to strategic marketing to help entrepreneurs develop new business prospects. (PLO1,C4)

CLO2: Analyze the various marketing management activities and their roles in enhancing entrepreneur technology-based industry competitiveness, as well as produce a marketing plan report. (PLO7, A5)

BVA3013

Automotive Legislation

Credit Hour: 3

Prerequisite: None

Synopsis

This course provides the students with the basic knowledge and theory regarding legislative on every aspect related to automotive aspects. The course objectives are to describe the Automotive standard available in the world and National Automotive Policy, Interpret vehicle safety requirement related to Malaysian Road Safety, and Explain the vehicle inspection requirement. The course covers the Automotive standards in the world, Malaysian perspective on automotive, Malaysia and regional automotive policy, Malaysia Standard, Vehicle Safety, and vehicle inspection. The course will assess the affective domain of teaching and learning.

Course Learning Outcomes

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

CLO1: Describe the Automotive standard available in the world and National Automotive Policy (PLO1,C5)

CLO2: Interpret vehicle safety requirement related to Malaysian Road Safety (PLO5, A5)

CLO3: Explain the vehicle inspection requirement (PLO6, A4)

BVA3043

Asset and Inventory Management

Credit Hour: 3

Prerequisite: None

Synopsis

This subject focuses on the role of warehouse and inventory management specifically for automotive industry. This module is run as Work Based Learning at the selected industry

Course Learning Outcomes

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

CLO1: Describe the role of warehousing (C4, PL03)

CLO2: Explain strategic framework for logistic and inventory management (P4,

PL02)

CLO3: Present the best practices of maintenance and asset management. (A2, PL07)

BVA3056

Quality Management

Credit Hour: 6

Prerequisite: None

Synopsis

This course provides a useful insight into concept, theories and application of quality management in an organization. Student will be introduced to tools and techniques of quality that are useful for practice, people and process improvement. This also includes approaches for planning, controlling and improving the quality management function of a system. Quality is a universal concept, its application and management encompasses a wide variety of field. Therefore, this course is suitable for individuals who aspire to be managers in their organizations in future regardless of their area of specialization.

Course Learning Outcomes

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

CLO1: Explain the basic quality principles and practices, quality solving techniques and product reliability related to manufacturing process (C2, PLO1)

CLO2: Solve the manufacturing process quality problem using appropriate problem solving techniques (P4, PLO2)

CLO3: Perform the ability to apply the quality control tools (A2, PLO4)

BVA3063

Risk Assessment

Credit Hour: 3

Prerequisite: None

Synopsis

Factors such as appropriate selection of personnel, adequate provision of training

and thorough consideration of occupational safety and health issues all help to reduce the incidence of injury and illness resulting from inadequate examination of potential hazards, poor ergonomic design, equipment failure, defective products or hazardous materials. The working environment, suitability of equipment and the competencies of staff all have to be considered in the context of legislative requirements and good management of health and safety. This document presents a structured approach to good management of safety and describes a universal framework for task or activity planning. It defines steps and processes which, if used as a common reference, will simplify and unify our management of health and safety risk and streamline our approach to planning tasks and activities.

Course Learning Outcomes

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

CLO1: Determine and apply knowledge of complex risk assessment theory to your professional practice and/or further study. (C4, PLO3)

CLO2: Apply logical, critical and creative thinking to analyse, synthesise and apply theoretical knowledge, and technical skills, to formulate evidenced based solutions to industry problems or issues. (P4, PLO2)

CLO3: Collaborate effectively with others and demonstrate intellectual independence and autonomy to solve problems and/or address industry issues and imperatives. (A3, PLO9)

BVA3314
Final Year Project 1
Credit Hour: 4
Prerequisite: None

Synopsis

The student needs to plan and implement the project individually that related to the respective engineering technology field. The student should implement a project, do the analysis and apply the theory to solve

the problems related to topic. At the end, the student should write a problem based learning report that covers problem statement, literature review, methodology to overcome the problem. The student needs to achieve the objective of the project and presented it in the report.

Course Learning Outcomes

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

CLO1: Explain the problem, objectives and scope of project associated to the industrial or community needs. (C2, PLO1)

CLO2: Use relevant theory to produce solution. (P4, PLO2)

CLO3: Present the preliminary findings in the oral and written forms effectively (A3, PLO4)

BVA3326
Final Year Project 2
Credit Hour: 6
Prerequisite: Final Year Project 1

Synopsis

This is the second part of the Bachelor Degree Project. Students are expected to continue the project performed in Bachelor Degree Project until completion. At the end of the semester, students are required to submit the Bachelor Degree Project report and present their projects for assessment.

Course Learning Outcomes

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

CLO1: Analyze data in a meaningful form using relevant tools. (C4, PLO3)

CLO2: Perform project implementation systematically. (P4, PLO2)

CLO3: Present the results in the oral and written forms effectively. (A3, PLO4)

BVA3412
Industrial Training
Credit Hour: 12

Prerequisite: None

Synopsis

Industrial training is a compulsory component for degree program students at Universiti Teknikal Malaysia Melaka (UTeM). The experience and skills acquired from a period of placement can be invaluable and provide the advantage to the students when applying for employment after graduation. During the training period with the relevant industry, students are expected to involve in the following areas of training in order to achieve the underlying objectives: Manufacturing, production process and / or its optimization process, mechanical design and product, maintenance and repair of equipments, product testing and quality control.

Course Learning Outcomes

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

- CLO1: Solve technology related problems using methods, tools and techniques learnt throughout the training (PLO3, C3)
- CLO2: Explain effectively with the technical community and produce technical reports and presentations. (PLO4,A4)
- CLO3: Demonstrate social ethique and professionalism in technology practice. (PLO8,A3)

BVA ELECTIVE COURSES

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

Synopsis

This course covers selected systems that needs schedule and unscheduled maintenance and service for the heavy duty vehicles as the commercial vehicles. The objective of the course is to expose on the technology utilized in the heavy duty

vehicles, including the rules and regulations in maintenance and service of commercial vehicles systems. The course start with a brief overview of the systems in the heavy duty vehicles. Later, the course covers selected systems such as; engine, emission, transmission, hydraulic and pneumatic brakes, tire. The course will assess the cognitive, psychomotor and affective domain of the student.

Course Learning Outcomes

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

- CLO1: Discover the current and future technology in the commercial vehicle system (C4, PLO1)
- CLO2: Organize various skills of servicing and repair as an individual or a group. (P5, PLO2)
- CLO3: Integrate the servicing and maintenance according to Standard Operating Procedure (SOP) (A4, PLO8)

BVA2124
Drivetrain Maintenance
Credit Hour: 2
Prerequisite: None

Synopsis

This course introduces students to the drivetrain system including transmission, wheels, suspension and steering. The course objectives are to identify components and function in various drivetrain system, perform tests and troubleshooting for faults detected in drivetrain system and explain the concept and the working principles of advanced drivetrain system. The course covers conventional, current and advanced technology in transmission, wheels, suspension and steering. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

Course Learning Outcomes

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

CLO1: Identify components and function in various drivetrain system (C4, PL01)
CLO2: Construct plan for testing and troubleshooting for faults detected in drivetrain system (P5, PLO2)
CLO3: Explain the concept and the working principles of advanced drivetrain system (A4, PLO4)

BVA2134
Surface Design
Credit Hour: 4
Prerequisite: None

Synopsis

The course introduced surfacing method that is used to construct the 3D CAD data which usually applied in industrial field. The course objective are to make sure students able to identify knowledge and comprehension in constructing surfacing data, demonstrate the proper features to use in constructing surfacing data and prepare surfacing data from the scanning data of automotive vehicles or components. The course covers the suitable features in constructing industrial design surfacing which will be applied which helps producing the quality and efficiently surfaces data data for technical communication purpose. The course will assess the cognitive, psychomotor and affective domain of students via assignment, test and project given. The project allowed students to construct the 3D CAD data of automotive vehicle or component using surfacing module with quality verification.

Course Learning Outcomes

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

CLO1: Identify knowledge and comprehension in constructing surfacing data for technical communication purpose
CLO2: Demonstrate the proper features to use in constructing surfacing data which emphasize the quality aspect (P5,
CLO3: Prepare surfacing data from the

scanning data of automotive vehicles or components (A4, PLO4)

BVA2144
Automotive Modelling
Credit Hour: 4
Prerequisite: None

Synopsis

This course provides the knowledge and skills regarding physical modelling process in automotive design development. The course objectives are to analyse appropriate physical techniques for building automotive components, construct 3-Dimensional physical model using proper tools, equipments and materials, and organize systematic workflow and process in completing modelling task. The course covers tools and equipment in modelling, materials in physical modelling, package and cross section drawing, casting for automotive component, clay modelling Fiber glass fabrication, laser cutting, vacuum forming Process, and CNC application in model making, and Labels and Decals. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

Course Learning Outcomes

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

CLO1: Analyse appropriate physical techniques for building automotive components (C4, PLO3)
CLO2: Construct 3-Dimensional physical model based suitable data using proper tools, equipments and materials (P5,
CLO3: Organize systematic workflow and process in completing the task that have been given (A4, PLO9)

BVA2154
Vehicle Performance Analysis
Credit Hour: 2
Prerequisite: None

Synopsis

This subject introduces the method for vehicle performance analysis. The objective of the subject is to distinguish vehicle performance analysis method and performance parameters, analyse the vehicle performance based on analytical and measurement method, and adapt the engine and chassis dynamometer for engine performance test. The topics covered are method of performance analysis, engine performance parameters, engine testing and test facilities, torque and power measurement and analysis, emission testing and analysis, fuel consumption testing and analysis, and other vehicle testing in industry. The course assesses the cognitive, psychomotor and affective domain of teaching.

Course Learning Outcomes

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

CLO1: Distinguish vehicle performance analysis method and performance parameters (PLO1, C4)

CLO2: Analyse the vehicle performance based on measurement and data analysis (PLO3, C4)

CLO3: Adapt the engine and chassis dynamometer for engine performance test and tuning. (PLO2, P6)

BVA2164

Vehicle Fault Diagnosis

Credit Hour: 4

Prerequisite: None

Synopsis

This course introduces the vehicle fault and diagnostic tools and technique. The course objectives are to analyse the various diagnostic tools and method used to check vehicle performance systems (drivetrain, powertrain and electrical components), Organise proper method to diagnose vehicle system (drivetrain, powertrain and electrical components), and explain the precaution and methodology during diagnostic. The course covers topic such as Identify and justify diagnosis

specification, Diagnosis specifications, Test equipment, Fault diagnosis, symptoms, Factors that contribute to diagnosis, Workshop testing, and Diagnostic techniques. The course assesses the cognitive, psychomotor and affective domain of teaching and learning

Course Learning Outcomes

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

CLO1: Analyse the various diagnostic tools and method used to check vehicle performance systems (drivetrain, powertrain and electrical components). (C4, PLO1)

CLO2: Organize proper method to diagnose vehicle system (drivetrain, powertrain and electrical components). (P4, PLO2)

CLO3: Explain the precaution and methodology during diagnostic the vehicle system (drivetrain, powertrain and electrical components). (A4,PLO4)

BVA2174

Exterior Design

Credit Hour: 4

Prerequisite: None

Synopsis

The course provides students with the knowledge and skills regarding designing an exterior part of the vehicle. The course objectives are to make sure students are able to identify and construct car exterior components based on appropriate car package and segmentation with consideration of design for safety. The course covers the concept of car exterior design and its regulations and how to develop it using CAID till simulation and visualization stages. The course will assess the cognitive, psychomotor and affective domain of student via assignments, test and project.

Course Learning Outcomes

By the end of semester, students should be

able to:

CLO1: Identify the concept of exterior components and its regulations (PL01, C4)

CLO2: Construct car exterior components based on appropriate car package and segmentation. (PL02, P5)

CLO3: Explain the car exterior components with consideration of design for safety. (PL05, A4)

BVA2184

Component Remanufacturing

Credit Hour: 4

Prerequisite: None

Synopsis

This course introduced method that is used to restore automotive components that is already discontinued from the markets or end of life. The course objectives are to construct the existing component using 3D scanning and 3D printing method, analyse and suggest suitable method and material for remanufacturing and integrate the teamworking and leadership skill in reconstruction. The course covers topic such as 3D scanning, additive manufacturing, fused deposition modelling, 3D printing and its related parameter, and reconstruction project. The course will assess the cognitive, psychomotor and affective domain of the student.

Course Learning Outcomes

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

CLO1: Construct the existing component using 3D scanning and 3D printing method. (P5, PLO2)

CLO2: Analyze and suggest suitable method and material for remanufacturing the component. (C4, PLO3)

CLO3: Integrate teamworking and leadership skill in reconstructing the part. (A4, PLO9)

BVA3114

Hybrid Servicing

Credit Hour: 4

Prerequisite: None

Synopsis

Hybrid Servicing introduces the knowledge and skills technology on hybrid vehicle services and maintenance. At the end of the course, the students should be able to explain the functions and operations of hybrid powertrain system and components, construct various skills of servicing and repair as an individual or a group, and perform the servicing and maintenance according to Standard Operating Procedure. The course covers hybrid vehicle inspection, energy storage system servicing, power electronic system servicing, supporting subsystem servicing and hybrid supervisory function. The course will assess the cognitive, psychomotor and affective domain of teaching and learning

Course Learning Outcomes

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

CLO1: Designate the functions and operations of hybrid powertrain system and components (C4, PLO1)

CLO2: Construct various skills of diagnose, service and maintenance of hybrid vehicles (P5, PLO2)

CLO3: Perform the servicing and maintenance according to Standard Operating Procedure (SOP) (A5, PLO8)

BVA3124

EV Servicing

Credit Hour: 4

Prerequisite: None

Synopsis

This course introduces the fundamentals of electric vehicle components, systems and its general services. The objective of this course are to analyse the vehicle's system and functions, demonstrate the fault diagnosis and service skills and preparing EV standard servicing procedure. The

students will be introduced to the EV safety standard practice, powertrain system, energy storage, EV faults and diagnosis, service and maintenance, and standard servicing procedure. The course will assess the cognitive, psychomotor and affective domain of the students.

Course Learning Outcomes

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

- CLO1: Analyse the function of each component and the system on Electric Vehicle (C4, PLO3)
- CLO2: Demonstrate the experiment to check the fault on EV and do a service accordingly (P4, PLO2)
- CLO3: Prepares the Standard of Operating Procedures (SOP) when conducting a service on EV (A4, PLO8)

BVA3134
Interior Design
Credit Hour: 4
Prerequisite: None

Synopsis

This courses provides the knowledge and skills regarding designing an interior components of the vehicle. The course objectives are to describe the concept of interior components and its regulations, construct and establish the car interior components with consideration of design for safety, and Explain the car exterior components with consideration of design for safety. The course covers Introduction to Automotive Interior Design, Cargo, Volume and Car Segmentation, Car Package and Applied Ergonomics, Interface Design - HMI, Instrument Panels and Consoles, Automotive Conceptual Development , Car Interior Design Development using CAID, Introduction to Interior Design Simulation and Visualization and Quality Inspection. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

Course Learning Outcomes

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

- CLO1: Evaluate the concept of interior components and its regulations (C4, PLO1)
- CLO2: Construct and establish the car interior components with consideration of design for safety. (P5, PLO2)
- CLO3: Explain the car exterior components with consideration of design for safety. (A4, PLO4)

BVA3144
Painting
Credit Hour: 4
Prerequisite: None

Synopsis

This courses aims to introduce the process and technique of automotive painting. The course objectives are to describe the concepts and methodologies of automotive painting process, technology and materials in industrial practice, apply correct procedures for painting, wrapping or water transfer, and demonstrate a good teamwork in completing projects. The course covers Introduction to OEM painting proces, Surface and Materials preparation, Automotive Painting Works, Quality Inspection, Sticker Wrapping, and Water Transfer. The course will assess the cognitive, psychomotor and affective domain of teaching and learning.

Course Learning Outcomes

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

- CLO1: Identify the concepts and methodologies of automotive painting process, technology and materials in industrial practice. C4,PLO1
- CLO2: Organise correct procedures for painting, wrapping or water transfer. P5,PLO2
- CLO3: Integrate a good teamwork in completing projects. A4,PLO9

CURRICULUM STRUCTURE
BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (OIL AND GAS) 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	BT*3**3B Elective 2	BTD4131 Occupational Safety and Health	
	BTD1133 Electrical and Electronics Technology	BCI1103 Computer Programming	BTD2133 Strength of Materials	BTD2232 Applied Control System	BTG2263 Introduction to Oil and Gas Industry	BT*3**3C Elective 3	BTD4122 Professional Practice and Ethics	
	BTD1151 Mechanical Laboratory 1	BTD1251 Mechanical Laboratory 2	BTD2142 Mechanical Measurement and Instrumentation	BTD2252 Hydraulic and Pneumatic	BTG3133 Static Equipment	BT*3**3D Elective 4	BTD3222 Internship Preparation	
	BTD1143 Manufacturing Processes	BTD1233 Thermodynamics	BTD2242 Heat Transfer	BUM2113 Applied Mathematics	BTG3333 Piping	UGE2002 Technopreneurship		
	BUM1113 Technical Mathematics	BUM1223 Calculus	BTD2273 Project Management and Economy	BT*3**3A Elective 1	BTG3233 Rotating Equipment	UHL2432 English for Professional Communication		
	UQA2002 Co-curriculum	UHL2412 English for Academic Communication	UHF1**1 Foreign Languages Level 1	UHC1032 Kursus Integriti dan Anti- Rasuah				
	UHC1012 Falsafah and Isu Semasa	UHC2022 Etika dan Peradaban	UHL2422 English for Technical Communication	UHF2**1 Foreign Languages Level 2				
TOTAL CREDIT	19	19	18	19	19	17	17	12
TOTAL CREDIT FOR GRADUATION	140							

**ELECTIVE 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	BTG3533	Element of Mechanical Design	3
9	BTG3543	Tank Design	3
10	BTG3553	Asset Reliability Practitioner	3
11	BTG3563	Boiler and Steam Engineers	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 FOR BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (OIL AND GAS) WITH HONOURS (BTG)

BTD1112

Statics

Credit Hour: 2

Prerequisite: None

Synopsis

This course introduces theory and application of principles required to solve applied statics problems. Topics included in this course are moment of force, resultant of forces, couple systems, and transmissibility of forces. The use of free-body diagrams and modeling and analysis of static equilibrium problems focusing on real world engineering applications and problem solving are emphasized. Moreover, the relation between externally applied loads and induced internal forces within structural members and analysis of statically determinate structures, such as trusses and beams, are taught. Axial, shear, and bending-moment diagrams and their relationship are also covered.

Course Learning Outcome

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

CLO 1: Determine the resultant of several vectors and moment of a force and location of centroids.

CLO 2: Analyze truss loads by the method of joint and sections.

CLO 3: Apply static equilibrium and friction laws to solve engineering problems.

BTD1123

Engineering Materials

Credit Hour: 3

Prerequisite: None

Synopsis

This course offers an engineering materials application, atomic bonding, mechanical and physical properties, microstructure and

phase diagram, ferrous and non-ferrous alloys, polymer, composite, ceramic, and advance materials.

Course Learning Outcome

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

CLO 1: Apply the fundamental of engineering and technology knowledge in improving productivity in mechanical technology, material technology, manufacturing technology, and service companies effectively.

CLO 2: Analyze problem related to material engineering.

CLO 3: Demonstrate the efficient communication through the written report of the engineering material problem.

BTD1133

Electrical and Electronics Technology

Credit Hour: 3

Prerequisite: None

Synopsis

This course offers an introduction to fundamental of electric circuit involving DC resistive network analysis, AC network analysis, diodes, bipolar junction transistors (BJT), operational amplifier (op-amp) and digital logic circuits.

Course Learning Outcome

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

CLO 1: Explain the fundamental of electric and electronic knowledge.

CLO 2: Construct electric circuit using basic circuit element.

CLO 3: Demonstrate teamwork and leadership in constructing the electric and electronic circuit.

BTD1143

Manufacturing Processes

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the student to various types of manufacturing processes used for converting raw material into finished products. This course will cover 3 basic principles in manufacturing which are additive, subtractive and formative.

Course Learning Outcome

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

CLO 1: Analyze different types of manufacturing processes.

CLO 2: Perform manufacturing process technique with standard operation procedure.

CLO 3: Demonstrate work efficiently in diverse teams during operating manufacturing process machine.

BTD1151

Mechanical Laboratory 1

Credit Hour: 1

Prerequisite: None

Synopsis

This course expose students to safe working habits, learn to identify standard materials used in metal fabrication, read blueprints, identify, use and care of measuring instruments, layout methods and basic hand tools. Emphasis is placed on operation of metrology, benchwork and lathe project.

Course Learning Outcome

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

CLO 1: Demonstrate safety in workshop, basic measurement technique, technical drawing, and skills in using lathe machine and hand tools.

CLO 2: Present the mechanical laboratory works.

CLO 3: Demonstrate leadership and teamworking in Laboratory presentation or report.

BTD1212

Product Development 1

Credit Hour: 2

Prerequisite: None

Synopsis

Product Development 1 emphasizes several key elements of the design process including defining design problems, generating ideas, and building solutions. Presents a range of design techniques to help students think about, evaluate, and communicate their designs from sketching to physical prototyping. This course includes the use of Theory of Inventive Problem Solving (TRIZ) method to solve the technical contradictions in design. Students work both individually and in teams.

Course Learning Outcome

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

CLO 1: Apply the knowledge of brainstorming techniques, design concept generation, design concept screening, and the problem-solving techniques.

CLO 2: Construct a low fidelity prototype to demonstrate the idea concept using the creative toolkits.

CLO 3: Demonstrate the ability to work and pitch in teams on a themed design project.

BTD1222

Dynamics

Credit Hour: 2

Prerequisite: Statics

Synopsis

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

Course Learning Outcome

By the end of semester, students should be

able to:

CLO 1: Analyze dynamics problems involving kinematics inclusive of absolute and relative motion.

CLO 2: Analyze dynamics problems involving kinetics of rigid bodies inclusive forces based from Newton's Second Law, work, energy and momentum problem.

CLO 3: Presents a project related to principles of dynamics.

BTD1233

Thermodynamics

Credit Hour: 3

Prerequisite: None

Synopsis

This course focuses on fundamental, application and evaluation of various engineering thermodynamics systems. Introduce fundamentals and applications of classical thermodynamics. Understand the concepts of heat, work, energy, and entropy, the First and Second Laws of Thermodynamics and their application. Introduction to the Carnot cycle and the concept of irreversibility. Understand the use of property diagrams in solving heat engine and heat pump cycles. Understand the operation and analysis of the Brayton, Otto, Diesel and Rankine cycles. Introduction to the analysis of refrigeration and heat pump cycles. Perform experiments to illustrate the concepts of Thermodynamics. Simple combustion processes.

Course Learning Outcome

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

CLO 1: Apply the concept of thermodynamics laws in close and open system, and solve related engineering thermodynamics applications.

CLO 2: Analyze the basic of thermodynamics processes with knowledge of law of thermodynamics and engineering consideration.

CLO 3: Measure thermodynamic

parameters in related problems i.e. thermodynamics processes, thermodynamics cycles and combustion cycle.

CLO 4: Demonstrate the work effectively in a team in solving applied problems related to thermodynamics.

BTD1243

Computer Programming

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the concept of computer programming language, input and output, variables, constants, arithmetic operations and mathematical functions, user-defined functions, selection making decision and repetitive construct, and array data structure. Student will be introduced to a microcontroller system to apply the programming concept and exposed to digital and analog input output control systems.

Course Learning Outcome

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

CLO 1: Construct program that utilizes standard input output operations, variables, arithmetic operation, and math functions.

CLO 2: Construct program with combination of basic microcontroller devices.

CLO 3: Apply program that utilizes control structure, looping, functions, and numeric arrays to solve Mechanical Engineering problems.

CLO 4: Demonstrate teamwork in completing a programming project.

BTD1251

Mechanical Laboratory 2

Credit Hour: 1

Prerequisite: None

Synopsis

This course introduce the students on safety procedures in workshop/laboratory, basic application of measuring instrument as well as the interpretation of technical drawing before operating machining process. Additionally, students will be exposed to the hands-on work in order to develop basics skills in handling machine for milling and surface grinding process.

Course Learning Outcome

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

- CLO 1: Demonstrate safety in workshop, demonstrate basic measurement technique, technical drawing interpretation, and basic skills in handling milling machine.
- CLO 2: Present the mechanical laboratory works.
- CLO 3: Demonstrate leadership and teamworking in Laboratory presentation or report.

BTD2113
Product Development 2
Credit Hour: 3
Prerequisite: None

Synopsis

This course introduces graphical communications, technical 2D drawing, 3D part modelling, components assembly and surface design using 3D CAD software. It also includes knowledge and techniques to render the 3D model and preparing a presentable graphics. This course also includes rapid prototyping (3D printing) process and measurement techniques as a simulation to the process involved in the part approval stage. Simple programming will be applied in their group prototype (i.e. embedded sensor in the prototype). Students work both individually and in teams.

Course Learning Outcome

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

- CLO 1: Apply basic knowledge of 2D product design sketching.
- CLO 2: Construct standard drawing relating to design in 3D.
- CLO 3: Demonstrate the standard industrial design drawing for product development.
- CLO 4: Integrate 3D printed parts of a prototype in the group design project.

BTD2123
Fluid Mechanics
Credit Hour: 3
Prerequisite: None

Synopsis

This course introduces the principle, properties and basic methods of fluid mechanics, and provide some understanding and analysis of some problems related to fluid mechanics. The course covers topics such as concept of pressure and flow with its application, stability of floating bodies, fluid in motion analysis, flow measurement devices, fluid friction in piping system, flow over immersed bodies, boundary layer analysis, and pumps. Students are also required to conduct laboratory activities and mini project dealing with course outcomes.

Course Learning Outcome

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

- CLO 1: Apply the basic principles and applications of fluid statics and fluid dynamics.
- CLO 2: Analyze problems related to flow in pipes, external flow, pump and system.
- CLO 3: Demonstrate as an effective team work to solve problems related to fluid mechanics.
- CLO 4: Present fluid mechanics projects.

BTD2133
Strength of Materials
Credit Hour: 3
Prerequisite: Statics

Synopsis

This course introduces the concepts in strength of materials, stress, strain and deformation under axial load, stress concentrations, torsional shear stresses for circular shaft and bending stresses. Design and beam analysis is introduced through the construction of shear force and bending moment diagram and selection for the beam design should lead to the most economical design.

Course Learning Outcome

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

CLO 1: Apply the basic concepts and principles of strength of materials.

CLO 2: Demonstrate the efficient communication through the report writing to solve the strength of material problem.

CLO 3: Analyze the design beam problems and real engineering technology applications.

BTD2142

Mechanical Measurement and Instrumentation

Credit Hour: 2

Prerequisite: None

Synopsis

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

Course Learning Outcome

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

CLO 1: Apply the basic element in mechanical measurement and instrumentation system; and fundamental of selected important transducers.

CLO 2: Build virtual instrumentation system to acquire data from transducer time and/or frequency domain.

CLO 3: Apply the appropriate signal analysis in measuring analogue signal from transducers.

BTD2213

Product Development 3

Credit Hour: 3

Prerequisite: Product Development 2

Synopsis

Provides students with an overview of design for entertainment and leisure, as well as opportunities in creative product design and design competition. Students develop a prototype to compete in a functional design competition. Work in teams with experienced mentors on a themed design project. Students enhance creativity and experience fundamental aspects of the product development process, including brainstorming, sketch modeling, concept development, design aesthetics, detailed design, and prototyping. Includes written, visual and oral communication.

Course Learning Outcome

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

CLO 1: Outline ideas and proposes a plan to design a functional prototype for design competition.

CLO 2: Construct a functional prototype through various elements of the systems design.

CLO 3: Demonstrate the functionality of the assembled product to meet the demands of client(s) in a competitive environment.

CLO 4: Report course activities as well as technopreneurship aspects of prototype through the logbook and completed final report.

CLO 5: Display adequate skills in project management and teamwork among peers.

BTD2223

Mechanical Vibration
Credit Hour: 3
Prerequisite: Dynamics

Synopsis

This course introduces fundamental of vibration and vibration analysis for single and multi-degree of freedom system. Additionally, student will be exposed to vibration measurement and fault diagnosis.

Course Learning Outcome

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

- CLO 1: Apply the fundamental of vibration based on single degree of freedom system
- CLO 2: Analyze single and multi-degree of freedom system.
- CLO 3: Constructs the vibration measurement by considering appropriate techniques, tools and methods.
- CLO 4: Demonstrate effective leadership and teamworking ability in completing the group project.

BTD2232
Applied Control System
Credit Hour: 2
Prerequisite: Dynamic

Synopsis

This course introduces the implementation of a control system and evaluation of criteria of performance of an LTI system, analyze its stability, and design of a controller to improve the system response and comply to a given specification. It includes practical demonstration in electro-mechanical application and implementation of PID and Fuzzy Logic controller.

Course Learning Outcome

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

- CLO 1: Differentiate an LTI system, and method to interact with the system using

command and sensors.
CLO 2: Analyze the performance of a system, the stability, and issues and limitation to controller implementation.
CLO 3: Build command and data acquisition of a system, transfer function from experimental response, and PID and Fuzzy Logic Controller to comply with specification.

BTD2252
Hydraulic and Pneumatic
Credit Hour: 2
Prerequisite: None

Synopsis

This course to provide the student with in depth background in the vast field of hydraulic and pneumatic system. This course covers all subject essential to understanding the design, analysis, operation, maintenance and application of hydraulic and pneumatic system. In term of design the course cover manual operated, electromechanical and Programmable Logic Control of hydraulic and pneumatic circuit system.

Course Learning Outcome

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

- CLO 1: Analyze Hydraulic/ Pneumatic components and circuits using manual operated, electro and Programmable Logic Control (PLC) system
- CLO 2: Construct the circuit complex of Hydraulic and Pneumatic System using software and hardware.

BTD2273
Project Management and Engineering Economy
Credit Hour: 3
Prerequisite: None

Synopsis

Project Management is essential for any organization that involves in any project.

The purpose of this course would be to expose the students to different aspects of project proposal preparation as well as implementation. In order to achieve this, the student will study the major theories, concepts and tools used in companies for the management of national and international projects. This course would benefit a professionally-oriented student who aspires to be a Project Team member in his or her career would benefit from this course.

Course Learning Outcome

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

CLO 1: Analyze the principles of project management, integrated approach, strategy and project selection and structure.

CLO 2: Identify the NOD stages and WBS, leadership and effect towards project management.

CLO 3: Explain the engineering economy decision based on the present, future and per annum value of cost.

CLO 4: Organizes a decision-making base on the engineering economic tool.

BTD2242

Heat Transfer

Credit Hour: 2

Prerequisite: None

Synopsis

This course formally introduces the basic concepts of heat transfer, transport coefficients, steady-state conduction, forced and natural convection, radiative heat transfer, and Heat exchangers.

Course Learning Outcome

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

CLO 1: Apply fundamental concept of heat conduction, convection and radiation.

CLO 2: Analyze problem related to one-dimensional heat flow in different

geometries, convective heat transfer both forced and free convection also radiative heat transfer.

CLO 3: Explain heat transfer concept effectively for industrial application.

BTD3114

Product Development 4

Credit Hour: 4

Prerequisite: Product Development 3

Synopsis

This course prepares a detailed comprehensive design project considering the design stages only. The student will learn how to apply the knowledge including project management, communication, documentation, teamwork and design methodology. The students will apply the data collections method to identify the customer needs as well and product benchmarking. Then, they will evaluate the needs to create product specification in order to develop the concept design until concept evaluation. This final concept evaluation will be proposed to the customer for the feedback. The final product design will be created using cad software considering manufacturing, assembly, material selections, fabrication method and environmental impact. Once the final design is finished, the final design will be simulated using simulation software in order to determine the reliability of the final design. This final design will then be proposed to the customer including the economic analysis to obtain the customer feedback for further improvement.

Course Learning Outcome

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

CLO 1: Outline ideas and proposes a plan to design a functional prototype to solve problems.

CLO 2: Construct a complete design including mechanical, electrical and software integration.

CLO 3: Demonstrate the functionality of the assembled design that meets the

requirements of the client.

CLO 4: Explain and demonstrate the functional design to the clients and evaluators.

CLO 5: Justifies the teamwork of peers through peer review.

BTD3123

Finite Element Analysis

Credit Hour: 3

Prerequisite: Strength of Materials

Synopsis

This course covers the basics of Finite Element Method and familiarize students in solving real world problems involving structural, frequency, heat transfer and thermal stress by using FE software.

Course Learning Outcome

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

CLO 1: Describe basics of FEM in mechanical engineering.

CLO 2: Design an appropriate FE model based on real world problems by using FE software.

CLO 3: Analyze and evaluate accuracy of FE model.

BTD3124

Product Development 5

Credit Hour: 4

Prerequisite: Product Development 4

Synopsis

This course requires students to study and implement the most economical fabrication/manufacturing/maintenance processes of their prototype based on the idea of design for manufacture and assembly principles. Fabricated prototype must undergo series of testing and demonstration in the relevant environment/expected environment to meet the requirements of technology readiness level TRL 6. Rectification and improvisation work of the prototype has to

be conducted in the most economical and practical ways to address the issues encountered during the testing/demonstration.

Course Learning Outcome

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

CLO 1: Ability of solving broadly defined engineering and technology problem during fabrication and integration.

CLO 2: Application of design simplicity through design for manufacture and assembly concept to address cost effective product, good demonstration of management, business practices and entrepreneurship.

CLO 3: Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities.

Prototype/product developed meets the requirements of community/society in needs or addressing industrial/agencies genuine problem.

CLO 4: Function effectively as individuals, and as members or leaders in diverse technical teams.

CLO 5: Documented or logged activities of fabrication, troubleshooting, and reports for future references, for professional development and to engage in independent and lifelong learning.

BTD3222

Internship Preparation

Credit Hour: 2

Prerequisite: None

Synopsis

This training provides students with industrial preparation and exposes student to professional skills and experience in mechanical engineering technology practice. Student will apply matured negotiation and excellent interpersonal attitude during training.

Course Learning Outcome

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

CLO 1: Describe basic professional engineering technology skills in industry level and relate to theory that had been learned during study such as planning, design, construction and management in courses.

CLO 2: Demonstrate interpersonal skills and matured negotiation surrounding with excellent ethics and responsible to the creator.

CLO 3: Practice professional engineering skills required in the industry.

BTD4112

Final Year Project

Credit Hour: 12

Prerequisite: None

Synopsis

This course is the first stage of Final Year Project which involves preliminary study and planning on a project. The aim of this course is to identify problems and proposing appropriate solutions. It is designed to expose the students in writing a research proposal which emphasizes on the research methodology. At the end of the course, students should be able to plan and execute their project according to the given period as well as to write the research report.

Course Learning Outcome

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

CLO 1: Initiate practical engineering skills required in the industry.

CLO 2: Explains effectively either orally or in written form.

CLO 3: Organize work according to plan using available resources.

CLO 4: Integrate into society and environment for sustainable development.

CLO 5: Combine interpersonal skills with professional ethics.

CLO 6: Practice current experience for better of mankind.

CLO 7: Design and development of engineering system.

BTD4122

Professional Practice and Ethics

Credit Hour: 2

Prerequisite: None

Synopsis

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

Course Learning Outcome

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

CLO 1: Describe the understanding of engineering profession, accreditations and professional bodies.

CLO 2: Demonstrate ethics, public responsibility and the laws apply in engineering practice.

CLO 3: Explain the understanding of sustainable engineering, ethics in research and design.

CLO 4: Organize the effective leadership and teamworking ability in completing the report and presentation.

BTD4131

Occupational Safety and Health

Credit Hour: 1

Prerequisite: None

Synopsis

The course aims is to familiarize students to the engineering safety principles. The students will be introduced to OSHA 1994 and Factories and Machinery Act 1967 focuses on specific aspects of occupational health and safety managements. At the end of the course, the students are expected to be able to practice occupational safety and health knowledge especially in the manufacturing, construction, oil and gas industries, such

as preparing health and safety strategies and developing internal policies as well as leading in-house training on safety and health issues and risks.

Course Learning Outcome

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

CLO 1: Explain the overview of national safety based on OSHA Act1994 and FMA 1967.

CLO 2: Explain the hazard identification, risk assessment and risk control on general duties and critical condition.

CLO 3: Demonstrate OSH legal requirements and plan its OSH programs and its impact on society based on Factories and Machineries Act and hazard classification.

BTD4212

Industrial Training

Credit Hour: 12

Prerequisite: Internship Preparation

Synopsis

This course exposes students to professional skills and experience in industrial company or related aspect. Students involved in actual project of the company from product development to process and distribution. The projects studied by the students deal with topics from elective subject acquired at the university. Students are responsible to find a suitable project at the training company. With this exposure, it will help to produce excellent, responsible and good attitude graduates.

Course Learning Outcome

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

CLO 1: Initiate practical engineering skills required in the industry.

CLO 2: Explains effectively either orally or in written form.

CLO 3: Organize work according to plan using available resources.

CLO 4: Integrate into society and environment for sustainable development.

CLO 5: Combine interpersonal skills with professional ethics.

CLO 6: Demonstrate team work and leadership skills to solve problems in companies.

CLO 7: Practice current experience for better of mankind.

CORE COURSES FOR BTG

BTG2263

Introduction to Oil and Gas Industry

Credit Hour: 3

Prerequisite: None

Synopsis

This is an introductory course to the upstream, mid-stream and downstream processing stages of the crude oil, gas and condensate products. It focuses on the methods/techniques, design concepts and applications relevant to various processes related in oil, gas and condensate production. Aspects of compliance to governmental acts, regulations and design standards are also being embedded into the course learning activities.

Course Outcome

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

CLO1: Analyse equipment and their inspection, maintenance and repair related to crude oil, gas and condensate production processing.

CLO2: Characterise the production processing systems based on design standards

CLO3: Relate industrial practices in relation to compliance of governmental acts, health and safety regulations, and design standards.

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.

CLO2: Characterise the production processing systems based on design standards.

CLO3: Relate industrial practices in relation to compliance of governmental acts, health and safety regulations, and design standards.

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.

CLO2: Conduct experimental investigation related to various rotating equipment.

CLO3: Able to evaluate major components, problems, and maintenance of turbo expander.

CL04: Able to display effective leadership and teamwork skills in preparing the group project.

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.
CLO2: Evaluate the required pipe thickness and its corresponding resultant stresses in the piping and critical components.
CLO3: Design of piping systems based on piping software to incorporate pipe modelling, joint/bolted connections and stress analysis within one platform.
CLO4: Demonstrate the ability to formulate solution to specific problems in piping system designs along with its fabrication and inspection through technical presentation.

ELECTIVE COURSES FOR BTG

BTD3323
Production Planning and Control
Credit Hour: 3
Prerequisite: None

Synopsis

This course introduces planning and control, forecasting, aggregate planning, production scheduling, just-in-time production, inventory management, material requirements planning. Simulation on production operation using Witness software is assigned.

Course Learning Outcome

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

- CLO 1: Evaluate forecasting method using qualitative and quantitative methods.
- CLO 2: Evaluate the aggregate planning using level, chase and transportation methods.
- CLO 3: Describe the best solution using Lean manufacturing and material requirement planning.
- CLO 4: Analyze a new production layout by using Witness software.

BTD3333
Mechanics of Composite Materials
Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces students to current views and theories in polymer based composite materials, on the types of materials, production methods, quality assurance, failure analysis, test methods and the mechanics of lamina and laminated composites.

Course Learning Outcome

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

- CLO 1: Explain different types of composite materials, production methods to produce polymer matrix composites and the main properties of a lamina and the laminated of composite materials.
- CLO 2: Compare the failure modes of composites and evaluate different type of failure criteria in laminated composites, and composite materials in the future.
- CLO 3: Describe mechanical test/simulation on laminated composites.

BTD3343
Fatigue Design and Analysis
Credit Hour: 3
Prerequisite: None

Synopsis

Introduction to factors affecting fatigue behavior and characteristics of design approach. Study on cycle counting techniques. Fatigue design methods including stress life, strain life and linear elastic fracture mechanics methods under constant and variable amplitude loading.

Course Learning Outcome

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

- CLO 1: Apply fatigue design criteria.
- CLO 2: Evaluate a component under fatigue loading.
- CLO 3: Construct Finite Element Analysis

for fatigue design.

BTA3313

Automotive Product Development

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the concept of automotive product development process. It covers the research and development process, stages of tooling process, production line process as well as the quality system used in automotive production line.

Course Learning Outcome

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

CLO 1: Explain the research and development process of automotive product and its organization.

CLO 2: Compare the tooling process in products development based on parts function.

CLO 3: Justify the manufacturing process flow in car production line based on safety and human factors.

CLO 4: Identify the effect of manufacturing process on the quality of the production parts.

BTA3323

Automotive Advance Technology

Credit Hour: 3

Prerequisite: None

Synopsis

This course is the advance construction, development and operational analysis of the state-of-the-art vehicle system which including engine advance control system for higher efficiency, lower emission, advance suspension for excellent ride and comfort, advance driveline for spacious, precision, minimum slips control, advance material for lighter, cheaper and stronger component, chassis and body, advance

energy powering system for renewable and sustainability future and advance vehicle mobility control.

Course Learning Outcome

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

CLO 1: Compares the antilock braking, vehicle aerodynamics, tire tread design advances.

CLO 2: Combines electronically controlled anti-vibration engine mountings and transport refrigeration.

CLO 3: Differentiate electricity, alcohol, and hydrogen fuel cells, as well as advanced additives and oils, in environmentally sustainable transport.

CLO 4: Explain of engine diagnosis and troubleshooting of automotive engine control systems including digital storage oscilloscopes, fuel injection and ignition system diagnoses, five-gas exhaust analysis and emission testing. Generate Seat belts, brake lights, and air bags, of safer vehicles and fewer fatalities.

BTA3333

Energy Efficient Vehicle

Credit Hour: 3

Prerequisite: Automotive Powertrain

Synopsis

Energy Efficient Vehicle or EEV is a new concept of categorize automotive technology towards the low fuel consumption, alternative and sustainable automotive system. Under the EEV definition, there are multiple approaches, technology, alternative fuels, materials and etc. In this course, some foundation of automotive highlighted and followed by sustainability of different green technology, electrification and detail hybrid electric vehicle design, operation, construction and diagnosis.

Course Learning Outcome

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

CLO 1: Evaluate the evolution of automotive electrification and technology sustainability.

CLO 2: Analyze the design of various energy efficient vehicle technology combination.

CLO 3: Summarize the architecture of different hybrid electric vehicle, safety design and influence 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 techniques 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.

BTG3533

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.

BTG3543

Tank Design

Credit Hour: 3

Prerequisite: None

Synopsis

This course provides a comprehensive understanding of aboveground storage tanks (ASTs) in the oil and gas industry, focusing on design, operation, and compliance with API 650 and 653 standards. Students will explore AST components and materials, learn to design tanks per API 650, master inspection and repair techniques following API 653, and grasp safety and environmental considerations. Real-world case studies and a final project will reinforce skills in designing, maintaining, and assessing ASTs, enabling students to contribute effectively to the industry's safe and efficient tank practices.

Course Outcome

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

CLO1: Identify the importance of aboveground storage tanks and the role of API standards in their design and operation.

CLO2: Evaluate various tank components, understand material selection criteria, and familiarize with welding practices.

CLO3: Design and construct the tanks, calculate key parameters, and comprehend fabrication processes based on API 650 guidelines.

CLO4: Analyze tank conditions, perform inspections, identify defects, and propose appropriate repair and alteration methods according to API 653.

BTG3553

Asset Reliability Practitioner

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces a comprehensive understanding of asset reliability principles and practices. This course will cover key topics related to ensuring the availability, performance, and longevity of critical assets in various industries. Through a combination of lectures, case studies, hands-on exercises, and real-world examples, students will gain the knowledge and skills necessary to become effective asset reliability practitioners.

Course Outcome

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

CLO1: Identify the understanding of asset reliability principles and applications across diverse industries.

CLO2: Evaluate asset reliability strategies based on reliability-centered maintenance (RCM) principles and predictive maintenance techniques to improve asset

performance.

BTG3563

Boiler and Steam Engineers

Credit Hour: 3

Prerequisite: None

Synopsis

This subject covers boilers, and steam engineers requirement according to act and legislation, risk Assessment and control, policy and procedure. It is a course that design to provide knowledge to manage safety, operation and maintenance elements in the boilers and power plant workplace. It includes policy, objectives, plans, procedures, organisation, responsibilities and other relevant measures.

Course Outcome

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

CLO1: Identify codes, Standard and relevant Laws related to Steam Boilers.

CLO2: Explain the boilers application, its efficiency, design and related application.

CLO3: Suggest control method or procedure to operate and troubleshoot boilers application during operation and maintenance.

CLO4: Suggest control method and procedure of 13 essential fittings, types of combustion, water treatment and related steam boiler inspection, maintenance and repairs.

**CURRICULUM STRUCTURE
BACHELOR OF MECHANICAL ENGINEERING WITH HONOURS**

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	UHC1032 Kursus Integriti dan Anti-Rasuah	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 Engineers in Society	BMM3762 ME Engineering Lab 4		
	BMM1722 ME Engineering Lab 1	BMM1233 Strength of Materials				KUK3562 Occupational Safety & Health		
	KUK1213 Computer Programming for Engineers				BMM3995 Industrial Training			
TOTAL CREDIT	18	17	17	18	17	21	14	14
TOTAL CREDIT FOR GRADUATION	136							

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

NO.	CODE	COURSE	CREDIT HOUR
1	BMM4213	Biomechanics & Biomedical Engineering	3
2	BMM4413	Hydraulics & Pneumatics	3
3	BMM4313	Mechanism Design	3
4	BMM4513	Power Plant Technology	3
5	BMM4223	Computational Fluid Dynamics	3
6	BMM4233	Corrosion Science & Engineering	3
7	BMM4723	Ergonomics	3
8	BMM4733	Production Planning Control	3
9	BMM4743	Quality Engineering	3
10	BMM4713	Metal Casting	3
11	BMM4113	Advanced Materials Characterisation Theories & Tools	3
Total Minimum Credit of Elective Subjects for Graduation			12

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

PROGRAMME OUTCOMES (PO)	
<p>Programme Outcomes describe what students are expected to know and be able to perform or attain by the time of graduation. These relate to the skills, knowledge, and behaviour that students acquire through the programme. Students of an engineering programme are expected to attain the following POs:</p>	
PO1	<p>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;</p>
PO2	<p>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);</p>
PO3	<p>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);</p>
PO4	<p>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;</p>
PO5	<p>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);</p>
PO6	<p>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);</p>
PO7	<p>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);</p>
PO8	<p>Ethics Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice (WK7);</p>
PO9	<p>Individual and Team Work Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings;</p>
PO10	<p>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;</p>
PO11	<p>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;</p>
PO12	<p>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</p>

BACHELOR OF MECHANICAL ENGINEERING WITH HONOURS

BMM 1711
Introduction to Engineering
Credit Hour:1
Prerequisite: None

Synopsis

This course is intended to expose fresh engineering students with the understanding of the importance of engineering in shaping the world's progress and development since early civilization 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 beginning until the final solution.

Course Outcome

01: To apply various tools and techniques for quality improvement.

02: To determine the control activities for betterment in operation or services.

03: To organise the priority of challenges and barriers in implementing six sigma

KUK4412
Project Management
Credit Hour: 2
Prerequisite: None

Synopsis

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

Course Outcome

- 01: Describe the elements phases involve in project lifecycle.
- 02: Differentiate types of project organization and explain the role of stakeholders in the project management.
- 03: Plan a project work program and apply techniques for resource management.
- 04: Apply and develop project planning and scheduling tasks into appropriate planning software.

BMM4824
Undergraduate Research Project 2
Credit Hour: 4
Prerequisite: BMM4812

Synopsis

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

Course Outcome

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

- 01: To identify and analyze research problems using the principles of mathematics, natural sciences or engineering science.
- 02: To design and develop solutions

based on research problems.

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

04: To practice the use of modern tools in science and engineering

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

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

BMM Elective Courses

BMM4213
Biomechanics & Biomedical Engineering
Credit Hour: 3
Prerequisite: None

Synopsis

This course introduces the principles and theories of biomechanics and biomedical engineering. The contents include basic concept of biomechanics on human movement, biomedical engineering components, musculoskeletal system, sport medicine and rehabilitation, human cardiovascular and respiratory system. Some equipment/machine are introduced to empower the student in problem solving.

Course Outcome

01: Attribute the basic concepts of biomechanics on human movement and biomedical engineering components.

02: Identify the requirement on musculoskeletal system, sport medicine and rehabilitation from biomechanics perspective.

03: Investigate the biomedical engineering in human cardiovascular and respiratory system to perform specific task.

04: Design the human system requirement focuses on specific biomedical devices and analyze using modeling of biomedical analysis or qualitative and quantitative approaches.

BMM4413
Hydraulics & Pneumatics
Credit Hour: 3
Prerequisite: None

Synopsis

This course introduces hydraulic and pneumatic systems, including the theoretical knowledge, components and the circuit design. Beside the basic hydraulic and pneumatic system, this course also introduces the electro fluid power system, as well as programmable logic controller (PLC) to control the system.

Course Outcome

- 01: Demonstrate fundamental fluid power knowledge in basic pneumatics system.
- 02: Analyze hydraulics system requirement for optimum performance.
- 03: Design an advanced electro-hydraulics and electro-pneumatics system.
- 04: Devise a hydraulics and pneumatics system using programmable logic controller.

BMM4313

Mechanism Design

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the fundamental and design of mechanism. Theory of mechanism will be carried out in series of lectures and analysis and design of mechanism will be carried out in integrated project. Topics that will be covered are mechanisms and kinematics, vector and position analysis, velocity analysis, acceleration analysis and cam design.

Course Outcome

- 01: Identify mechanism and design mechanism parameters related to motion, degree of freedom and analyze the position of the links in a mechanism.
- 02: Analyze the velocities and accelerations of links and points on mechanisms.
- 03: Design and construct the cam profile/mechanism and design mechanisms system using synthesis and analysis method.
- 04: Use related computer programs to design, model and analyze mechanisms.

BMM4513

Power Plant Technology

Credit Hour: 3

Prerequisite: None

Synopsis

This course discusses thermal based power generation such as steam power plant, gas power plant, combined cycle power plants and sustainable energy power systems. This course also covers fuels and combustions in power plant, cogeneration and trigeneration in power plant system, and environmental issues on power generation. Special topic of thermal based power generation also covered in this course which related to sustainable and renewable power generation.

Course Outcome

- 01: Analyze steam and gas power plants based on thermodynamics principle.
- 02: Analyse fuels and combustions for steam and gas power plants based on chemical equation and thermodynamics analysis.
- 03: Evaluate performance of combined cycle, co-generation and sustainable power generation systems of power plant.
- 04: Explain environmental problems and related issues in power plant and energy generation and propose engineering solution for the problem.

BMM4223

Computational Fluid Dynamics

Credit Hour: 3

Prerequisite: None

Synopsis

This subject aims to introduce the principal concepts and methods of Computational Fluid Dynamics (CFD) for solving thermo-fluid problems. It starts with the introduction of the basic (governing) equations that represent the thermo-fluid problems and the theory of CFD based on the Finite Volume Method. In addition, an awareness of the limitations of CFD codes and their applications to fluid and heat transfer problems are also included. The last part of this introductory course focuses on solving some practical problems utilizing commercial software.

Course Outcome

- 01: Attribute the main elements of CFD and the governing equations that represent flow and heat transfer problems.
- 02: Evaluate the flow and energy governing equations using various

discretization techniques.

03: Design solutions for complex problems using various velocity-pressure coupling methods and perform error analysis.

04: Develop a CFD simulation model and investigate the performance of the model at various conditions.

BMM4233

Corrosion Science & Engineering

Credit Hour: 3

Prerequisite: None

Synopsis

The course aims to investigate the fundamental causes of corrosion problems and its protection method. This course emphasizing the basic theory on electrochemistry including the corrosion reactions, thermodynamics and kinetics of corrosion, types of corrosive environment, forms of corrosion on structural material, the corrosion protection method including material selections, environment modification and cathodic protection, types and procedures of corrosion testing and also method to inspect and monitor corrosion. For project assignment, students involve with experiments and modelling to evaluate corrosion reactions, environmental failure, and basic methods for protection of materials.

Course Outcome

01: Evaluate the basic principle of electrochemistry of aqueous corrosion and justifying the thermodynamics and kinetics of corrosion.

02: Identify the main types of corrosive environment and its condition.

03: Analyse the forms of corrosion and corrosion failure in industrial application and propose method for corrosion protection.

04: Justify types of corrosion testing and elaborate the corrosion inspection and monitoring method

BMM4723

Ergonomics

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces students to ergonomics principles and their application in the design of work, equipment and the

workplace. Consideration is given to musculoskeletal disorders, manual handling, and ergonomics aspects of the workplace.

Course Outcome

01: Understand and apply ergonomic principles to the creation of safer, healthier and more efficient and effective activities in the workplace.

02: Understand the causes of work-related Musculoskeletal Disorders at the workplace.

03: Apply ergonomic risk assessments and appropriate measures.

03: Analyze ergonomically workplace layout and motions at the workplace.

BMM4733

Production Planning & Control

Credit Hour: 3

Prerequisite: None

Synopsis

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

Course Outcome

01: Develop a project management with CPM, PERT and cost-time-trade off.

02: Apply quantitative and qualitative methods to forecast a demand.

03: Analyse the aggregate planning by using level, chase, mixed and transportation methods.

04: Recommend the best methods of Lean manufacturing and material requirement planning to be implemented in a selected case study.

BMM4743

Quality Engineering

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces students to fundamentals of quality management and statistical quality improvement concepts. A

practical state-of-the-art approach is stressed to ensure sufficient theory is presented to develop robust understandings on quality principles to monitor, control, improve product and processes.

Course Outcome

- 01: Apply quality management concepts.
- 02: Apply and analyse the findings from various types of quality tools.
- 03: Develop quality monitoring plan using quality concepts and tools.
- 04: Investigate the findings from quality statistical process control tools.

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

**CURRICULUM STRUCTURE
BACHELOR OF TECHNOLOGY IN WELDING WITH HONOUR**

YEAR	FIRST		SECOND		THIRD		FOURTH	
SEM	FIRST	SECOND	FIRST	SECOND	FIRST	SECOND	SM	FIRST
COURSES	BVW1014 Safety in Welding	BVW1043 Product Design in Welding	BVW2074 Imperfection in Welding and Testing	BVW2154 Capstone Technopreneurship 1	BVW3154 Capstone Technopreneurship 2	BVW3204 Reclamation in Welding	BVW3286 Final Year Project 2	BVW4212 Industrial Training
	BVW1024 CAD and Welding Graphics	BVW1054 Welding Documentation	BVW2084 Material Behaviour in Welding	BVW2114 Computer Aided Analysis	BVW3124 Welding Quality Assurance	BVW3214 Managing Production/Supervi sory		
	BVW1034 Metal Fabrication Technology	BVW1064 Non-Conventional Welding Process	BVW2094 Safety Management	BVW2134 Non Destructive Test	BVW3114 Economic of Welding and Procurement	BVW3284 Final Year Project 1		
	UGE2022 Technopreneurshi p	UHF1111 Mandarin for Beginners	BVW2104 Welding Design Analysis	BVW2124 Electrical Welding Equipment	BVW3193 Cyber Physical System in Welding			
	UHC1012 Falsafah dan Isu Semasa	UHL2442 Essential English	UHL2452 English for Vocational Purpose	UHC1032 KIAR	BVW3164 NDT for Professional			
		UQA2002 Cocurriculum	UHF2111 Mandarin for Intermediate	UHC2022 Penghayatan Etika dan Peradaban				
TOTAL CREDIT	16	16	19	20	19	12	6	12
TOTAL CREDIT FOR GRADUATION	120							

**ELECTIVE COURSE TO BE OFFERED IN
BACHELOR OF TECHNOLOGY IN WELDING WITH HONOURS**

NO.	CODE	COURSE	CREDIT HOUR
1	BVW3164	NDT for Professional	4
2	BVW3**4	Welder Specialist (to be offered)	4
3	BVW3**4	Welder Inspector (to be offered)	4
Total Minimum Credit of Elective Subjects for Graduation			4

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)	
PEO1	To produce welding technologist that perform related welding work including maintenance, fabricator, design, safety advisor and production manager.
PEO2	To produce technopreneurs in related welding technology.
PEO3	To produce relevant, respected and referred professionals in welding 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 FOR DEGREE
TECHNOLOGY PROGRAMME
2023/2024**

WELDING TECHNOLOGY

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.

Course Learning Outcomes

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

- CLO1: Identify welding hazards that impact the safety, health, and environment at working area.
- CLO2: Explain the welding risk control by various procedures in the working environment.
- CLO3: Control method or procedure to minimize or remove the impact of possible hazard in the working environment.

BVW1024
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 specially for welding application. Student will be exposed to geometry drawing, orthographic drawing, section view, isometric drawing, assembly drawing,

dimension, tolerance, welding symbol and standard codes using manual sketches and computer aided design (CAD) software.

Course Learning Outcomes

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

- CLO1: Explain the engineering drawings include welding symbol and standard codes.
- CLO2: Construct technical drawing using manual sketching and computer aided design.
- CLO3: Communicate by using engineering drawings for welding application.

BVW1034
Metal Fabrication Technology
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.

Course Learning Outcomes

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

- CLO1: Organizing themselves either its individuals or in groups during project generating process.
- CLO2: Manipulating the basic principles and scientific processes and materials to produce products with reasonable judgment.
- CLO3: 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.

Course Learning Outcomes

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

CLO1: Apply an appropriate design method of developing a practical solution of product design problem.

CLO2: Develop a practical design solution through a systematic investigation of the product design problem especially welding product application.

CLO3: 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.

Course Learning Outcomes

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

CLO1: Apply welding procedure qualification and welder qualification Interpret various type of drawing design and symbol in welding according to related standard.

CLO2: Construct various type of drawing design and symbol in welding according to related standard.

CLO3: Demonstrate type of drawing design and symbol in welding as required according to related standard.

BVW1064

Non-conventional Welding Process

Credit Hour: 4

Prerequisite: None

Synopsis

This subject is to provide student with welding processes that are not commonly used in the current industries that can be categories as new or advanced welding technology. Students will be exposed all welding processes and required should be able to perform process selection when deal with the special and complex demand of welding work.

Course Learning Outcomes

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

CLO1: Identify types of joining processes applied in manufacturing sector.

CLO2: Explain the characteristics of joining in terms of process, equipment and setup.

CLO3: Practice the joining processes using certain equipment to make variety of joints.

BVW2074

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 require to perform 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).

Course Learning Outcomes

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

CLO1: Apply welding inspection method.
CLO2: Implement the characteristics of metal properties and destructive testing.
CLO3: Analyse the inspection and other NDE methods.

BVW2084
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 process 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.

Course Learning Outcomes

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

CLO1: 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.

CLO2: Understand the behavior of structural in fusion welding and testing of materials welded joints.

CLO3: 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 design to provide knowledge for managing activities in the business workplace that apply comprehensive management system designed to manage safety elements in the workplace. It includes acts, policy, objectives, plans, risk assesment, procedures, organisation, responsibilities and other measures. This is important to prevent accidents, injuries and other impact to the organisation that shows the role of management that focus to deter such catastrophic.

Course Learning Outcomes

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

CLO1: Explain the different requirements and regulations of Factory and Machinery Act, Occupational Safety and Health Act.

CLO2: Conduct hazard identification and risk assessment in workplace.

CLO3: Construct preventive and control technique according to the acts pertinent to the 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.

Course Learning Outcomes

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

CLO1: Describe basic concepts and fundamental principles of mechanical applications.

CLO2: Apply basic concepts and fundamental principles to solve design for welding application.

CLO3: 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 surface with emphasis on design intent. The students also will expose 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 drafting stage, part, assembly (weld product) and Finite Element Analysis (weld product).

Course Learning Outcomes

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

CLO1: Apply fundamental sketching and

feature modeling, build feature based models of parts and assemblies for easy editing.

CLO2: Produce document design intent of parts and assemblies (include weld design) in manufacturing drawings.

CLO3: Analyse basic stress analysis for welding connection.

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.

Course Learning Outcomes

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

CLO1: 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.

CLO2: 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.

CLO3: Measure the welding current, voltage, temperature, load and displacement using equipment's 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.

Course Learning Outcomes

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

- CLO1: Explain the current basic and some advanced principles of Non-Destructive Testing (NDT) techniques to satisfy complex engineering problems.
- CLO2: Select and propose suitable NDT techniques based on their analysis on engineering problems that fulfill the standard practice.
- CLO3: Develop the ability to communicate effectively using available resources to disseminate knowledge of NDT techniques in relation with industrial problem.

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 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.
- CLO2: Acquire skills to analyze financial statements.
- CLO3: Present financial information for new business.
- CLO4: 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 materials.

Course Learning Outcomes

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

CLO1: Explain the importance of effective costing and the factors influencing welding costs.

CLO2: Calculate welding costs that include machine, material and labour.

CLO3: 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 with 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, Nonconformances and Corrective Actions, Preventive Actions, Quality Audits, Records and Documents Control.

Course Learning Outcomes

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

CLO1: Design a plan for quality assurance and control in welding manufacturing process using according specifications and standards.

CLO2: Demonstrate the procedure and inspection techniques related to welding assurance and control.

CLO3: 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 enterprise company takes 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 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.

Course Learning Outcomes

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

CLO1: Apply the business model canvas incorporating human and financial elements.

CLO2: Acquire skills to resolve organizational conflicts.

CLO3: Write a convincing business plan.

CLO4: Evaluate vital organizational behaviours necessary to grow a new venture.

CLO5: 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 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.

Course Learning Outcomes

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

CLO1: Explain the added value that can be achieved through application of CPS in welding process.

CLO2: Demonstrate effectively the appropriate CPS tools in acquiring process variables in real time.

CLO3: Criticise the logged data acquired from conventional and non-conventional welding techniques.

BVW3204
Reclamation in Welding
Credit Hour: 4
Prerequisite: None

Synopsis

The aim of this subject is to acquire knowledge and to solve problems associated with failure and to update personal on the latest technology to ensure welded subject would be maintained in good operating condition and at low maintenance cost.

Course Learning Outcomes

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

CLO1: Repair quality of welding which will benefit the industry in term of productivity and savings.

CLO2: Develop the skills to carry out practical feasible repair techniques maintaining low cost.

CLO3: 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 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.

Course Learning Outcomes

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

CLO1: Identify the standardize the welding procedure.

CLO2: Identify required maintenance of equipment and record.

CLO3: 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 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 objectives 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.

CLO2: Use relevant theory to produce solution.

CLO3: Choose a proper methodology.

CLO4: 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 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.

CLO2: Interpret data in a meaningful form using relevant tools.

CLO3: Work independently and ethically.

CLO4: Present the results in the oral and written forms effectively.

BVW3212

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 involve 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.

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.

CLO2: Explain effectively with the technical community and produce technical reports and presentations.

CLO3: Demonstrate social ethics and professionalism in technology practice.

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	BCI1103 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		
	UQA2002 Co-curriculum	UHL2412 English for Academic Communication	UHF1**1 Foreign Languages Level 1	UHC1032 Kursus Integriti Dan Anti-Rasuah (KIAR)				
	UHC1012 Falsafah and Isu Semasa	UHC2022 Penghayatan Etika dan Peradaban	UHL2422 English for Technical Communication	UHF2**1 Foreign Languages Level 2				
	UHL2400 Fundamentals Of English Language							
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	BTG3533	Element of Mechanical Design	3
9	BTG3543	Tank Design	3
10	BTG3553	Asset Reliability Practitioner	3
11	BTG3563	Boiler and Steam Engineers	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 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 emphasised. Moreover, the relation between externally applied loads and induced internal forces within structural members such as trusses and frames, are taught.

Course Learning Outcome

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

- CLO 1: Apply the basic operations with force systems to solve resultant force.
- CLO 2: Analyze problems involving the equilibrium of particles and rigid bodies.
- CLO 3: Analyze the equilibrium condition for structural and friction problem.

BTD1123
Engineering Materials
Credit Hour: 3
Prerequisite: None

Synopsis

This course offer 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 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 and design concept screening.

CLO 2: Construct a low fidelity prototype to demonstrate the idea concept using the creative toolkits.

CLO 3: Apply the knowledge of Theory of Inventive Problem Solving (TRIZ) to solve the engineering contradictions.

CLO4: Demonstrate the ability to communicate the design ideas or design concepts.

BTD1222

Dynamics

Credit Hour: 2

Prerequisite: Statics

Synopsis

This course covers rigid body kinematics and kinetics of 2D planar motions. 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, impulse-momentum or work-

energy, the students should be able to solve the kinetics problems of 2D planar motion.

Course Learning Outcome

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

CLO 1: Analyse the linear velocity and acceleration of a point, or angular velocity and angular acceleration of remaining links.

CLO 2: Apply the Newton's Second Law of Motion to determine the acceleration and angular acceleration of a body.

CLO 3: Apply the Principle of Work and Energy and the Principle of Impulse and Momentum to determine the velocity and angular velocity of a body.

BTD1233

Thermodynamics

Credit Hour: 3

Prerequisite: None

Synopsis

This course focuses on fundamental, application and evaluation of various engineering thermodynamics systems. It covers the concepts of heat, work, energy, the First and Second Laws of Thermodynamics and their applications. Introduction on various cycles of heat engines and heat pump including Brayton, Otto, Diesel and Rankine cycles and also chemical equation related to combustion will also be carried out. Experiments and data measurement of thermodynamics related equipment will also be performed.

Course Learning Outcome

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

CLO 1: Apply the fundamental concept of thermodynamics in related applications.

CLO 2: Analyze various thermodynamics systems using the First and Second Law of Thermodynamics.

CLO 3: Demonstrate the thermodynamics

concepts via experimental work and laboratory report.

BCI1103

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: Demonstrate the principles and concept of computer programming to solve problems with utilization of mathematics & sciences knowledge.

CLO 2: Solve scientific or engineering problem using numerical knowledge with computer programming.

CLO 3: Illustrate solutions using appropriate digital tools and platform.

BTD1251

Mechanical Laboratory 2

Credit Hour: 1

Prerequisite: None

Synopsis

This course introduces 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, welding and sheet metal

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, welding and sheet metal fabrication.

CLO 2: Demonstrate the mechanical laboratory works.

CLO 3: Demonstrate leadership and teamworking in group project.

BTD2113

Product Development 2

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces graphical communications, technical 2D drawing, 3D part modelling, components assembly and surface design using 3D CAD software. It also includes knowledge and techniques to render the 3D model and preparing a presentable graphics. This course also includes rapid prototyping (3D printing) process and measurement techniques as a simulation to the process involved in the part approval stage. Simple programming will be applied in their group prototype (i.e. embedded sensor in the prototype). Students work both individually and in teams.

Course Learning Outcome

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

CLO 1: Apply basic knowledge of 2D product design sketching.

CLO 2: Construct standard drawing relating to design in 3D.

CLO 3: Demonstrate the standard industrial design drawing for product development.

CLO 4: Integrate 3D printed parts of a

prototype in the group design project.

BTD2123

Fluid Mechanics

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the principle, properties and basic methods of fluid mechanics, and provide some understanding and analysis of some problems related to fluid mechanics. The course covers topics such as concept of pressure and flow with its application, stability of floating bodies, fluid in motion analysis, flow measurement devices, fluid friction in piping system, flow over immersed bodies, boundary layer analysis, and pumps. Students are also required to conduct laboratory activities and mini project dealing with course outcomes.

Course Learning Outcome

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

CLO 1: Apply the basic principles and applications of fluid statics and fluid dynamics.

CLO 2: Analyze problems related to flow in pipes, external flow, pump and system.

CLO 3: Demonstrate as an effective team work to solve problems related to fluid mechanics.

CLO 4: Present fluid mechanics projects.

BTD2133

Strength of Materials

Credit Hour: 3

Prerequisite: Statics

Synopsis

This course introduces the concepts in strength of materials, stress, strain and deformation under axial load, stress concentrations, torsional shear stresses for circular shaft and bending stresses. Design and beam analysis is introduced through

the construction of shear force and bending moment diagram and selection for the beam design should lead to the most economical design.

Course Learning Outcome

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

CLO 1: Apply the basic concepts and principles of strength of materials.

CLO 2: Demonstrate the efficient communication through the report writing to solve the strength of material problem.

CLO 3: Analyze the design beam problems and real engineering technology applications.

BTD2142

Mechanical Measurement and Instrumentation

Credit Hour: 2

Prerequisite: None

Synopsis

This course introduces the principles of mechanical measurement, basic signal analysis and provides the students hands-on laboratory experience with a variety (or selected) transducers and instruments (including 'virtual instruments'). Students are also 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: Completes course activities report as well as technopreneurship aspects of prototype through the logbook and completed final report.

CLO 5: Display adequate skills in project management and teamworkship 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: Explain the principles of project management, integrated approach, strategy and project selection and structure.

CLO 2: Identify the activity on NOD stages and Work Breakdown Structure (WBS), leadership and effect towards project management.

CLO 3: Analyze engineering economics problem and recommend a solution 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: Thermodynamics

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 familiarise students in solving engineering problems involving structural, natural frequency, heat transfer and thermal stress by using Finite Element commercial software.

Course Learning Outcome

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

CLO 1: Evaluate fundamentals of Finite Element Method in mechanical engineering.

CLO 2: Construct an appropriate FE model based on real world problems by using Finite Element 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 through 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 principle in automotive, and latest technology of the development in the automotive fields.

CLO2: demonstrate 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 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 introduces students to analytical and computational methods for analyzing vehicle electrical and electronics components and 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 to advanced knowledge and hands-on experience to the students on automotive systems, their 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 systems, electrical systems and drivetrain systems.

Course Learning Outcomes

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

CLO1: Distinguish various automotive

system symptoms, possible faults, and diagnostic tools and methods used in automotive fault diagnosis.

CLO2: Compose reliable methods to diagnose vehicle systems based on the reported and sensed error symptoms.

CLO3: Design diagnostic procedures for the 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: Conclude 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: Criticize the manufacturing process flow in car production line based on safety and human factors.

CLO 4: Analyze 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.

BTG3533

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.(C4,PLO1)

CLO 2: Evaluate the stresses in machine elements under various loads. (C5, PLO3)

CLO 3: Explain a mechanical structure design involving machine elements such as shaft, gears, bearing, fastener, belt and spring.(A4, PLO4)

BTG3543

Tank Design

Credit Hour: 3
Prerequisite: None

Synopsis

This course provides a comprehensive understanding of aboveground storage tanks (ASTs) in the oil and gas industry, focusing on design, operation, and compliance with API 650 and 653 standards. Students will explore AST components and materials, learn to design tanks per API 650, master inspection and repair techniques following API 653, and grasp safety and environmental considerations. Real-world case studies and a final project will reinforce skills in designing, maintaining, and assessing ASTs, enabling students to contribute effectively to the industry's safe and efficient tank practices.

Course Outcome

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

CLO1: Identify the importance of aboveground storage tanks and the role of API standards in their design and operation (C4, PLO1)

CLO2: Evaluate various tank components, understand material selection criteria, and familiarize with welding practices (C5, PLO1)

CLO3: Design and construct the tanks, calculate key parameters, and comprehend fabrication processes based on API 650 guidelines (C5, PLO3)

CLO4: Analyze tank conditions, perform inspections, identify defects, and propose appropriate repair and alteration methods according to API 653. (C4, PLO3)

BTG3553
Asset Reliability Practitioner
Credit Hour: 3
Prerequisite: None

Synopsis

This course introduces a comprehensive understanding of asset reliability principles

and practices. This course will cover key topics related to ensuring the availability, performance, and longevity of critical assets in various industries. Through a combination of lectures, case studies, hands-on exercises, and real-world examples, students will gain the knowledge and skills necessary to become effective asset reliability practitioners.

Course Outcome

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

CLO1: Identify the understanding of asset reliability principles and applications across diverse industries. (C4, PLO1)

CLO2: Evaluate asset reliability strategies based on reliability-centered maintenance (RCM) principles and predictive maintenance techniques to improve asset performance. (C5, PLO3)

BTG3563
Boiler and Steam Engineers
Credit Hour: 3
Prerequisite: None

Synopsis

This subject covers boilers, and steam engineers requirement according to act and legislation, risk Assessment and control, policy and procedure. It is a course that design to provide knowledge to manage safety, operation and maintenance elements in the boilers and power plant workplace. It includes policy, objectives, plans, procedures, organisation, responsibilities and other relevant measures.

Course Outcome

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

CLO1: Identify codes, Standard and relevant Laws related to Steam Boilers (C4, PLO1)

CLO2: Explain the boilers application, its efficiency, design and related application

(C4,PLO1)

CLO3: Suggest control method or procedure to operate and troubleshoot boilers application during operation and maintenance (C5,PLO3)

CLO4: Suggest control method and

procedure of 13 essential fittings, types of combustion, water treatment and related steam boiler inspection, maintenance and repairs.(C4, PLO3)

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	BCI1103 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		
	UQA2002 Co-curriculum	UHL2412 English for Academic Communication	UHF1**1 Foreign Languages Level 1	UHC1032 Kursus Integriti dan Anti- Rasuah				
	UHC1012 Falsafah and Isu Semasa	UHC2022 Penghayatan Etika dan Peradaban	UHL2422 English for Technical Communication	UHF2**1 Foreign Languages Level 2				
TOTAL CREDIT	19	19	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	BTG3533	Element of Mechanical Design	3
9	BTG3543	Tank Design	3
10	BTG3553	Asset Reliability Practitioner	3
11	BTG3563	Boiler and Steam Engineers	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 (Design and Analysis) problems.
PEO2	Graduates are capable of engaging with continuous development and adopt evolving technologies.
PEO3	Graduates are competent, responsible and practice professionalism.

PROGRAMME LEARNING OUTCOMES (PLO)

PLO1	Apply the knowledge of technology fundamental to broadly-defined procedures, processes, systems and methodologies in the field of study.
PLO2	Propose and employ current tools and techniques to resolve broadly-defined problems.
PLO3	Demonstrate deep investigative and significant thinking abilities to solve broadly-defined problems in the field of study.
PLO4	Communicate effectively and flexibly in oral and written language for social, academic and professional purposes.
PLO5	Illustrate the understanding of corresponding issues related to the society and the subsequent responsibilities to the broadly-defined technology practices.
PLO6	Acknowledge the requirement of professional establishment and to employ independent continuing learning in specialist technology.
PLO7	Illustrate consciousness of management and technopreneurship routine in real perspective.
PLO8	Illustrate ethical awareness and professionalism.
PLO9	Illustrate leadership character, mentoring and work efficiently in diverse teams.

COURSE SYNOPSIS FOR BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (DESIGN AND ANALYSIS) WITH HONOURS

BTD1112
Statics
Credit Hour: 2
Prerequisite: None

Synopsis

This course introduces theory and application of principles required to solve applied statics problems. Topics included in this course are moment of force, resultant of forces, couple systems, and transmissibility of forces. The use of free-body diagrams and modeling and analysis of static equilibrium problems focusing on real world engineering applications and problem solving are emphasised. Moreover, the relation between externally applied loads and induced internal forces within structural members such as trusses and frames, are taught.

Course Learning Outcome

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

- CLO 1: Apply the basic operations with force systems to solve resultant force.
- CLO 2: Analyze problems involving the equilibrium of particles and rigid bodies.
- CLO 3: Analyze the equilibrium condition for structural and friction problem.

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 covers rigid body kinematics and kinetics of 2D planar motions. 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, impulse-momentum or work-energy, the students should be able to solve the kinetics problems of 2D planar motion.

Course Learning Outcome

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

CLO 1: Analyse the linear velocity and acceleration of a point, or angular velocity and angular acceleration of remaining links.

CLO 2: Apply the Newton's Second Law of Motion to determine the acceleration and angular acceleration of a body.

CLO 3: Apply the Principle of Work and Energy and the Principle of Impulse and Momentum to determine the velocity and angular velocity of a body.

BTD1233

Thermodynamics

Credit Hour: 3

Prerequisite: None

Synopsis

This course focuses on fundamental, application and evaluation of various engineering thermodynamics systems. It covers the concepts of heat, work, energy, the First and Second Laws of Thermodynamics and their applications. Introduction on various cycles of heat engines and heat pump including Brayton, Otto, Diesel and Rankine cycles and also chemical equation related to combustion will also be carried out. Experiments and data measurement of thermodynamics related equipment will also be performed.

Course Learning Outcome

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

CLO 1: Apply the fundamental concept of thermodynamics in related applications.

CLO 2: Analyze various thermodynamics systems using the First and Second Law of Thermodynamics.

CLO 3: Demonstrate the thermodynamics concepts via experimental work and laboratory report.

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: Demonstrate the principles and concept of computer programming to solve problems with utilization of mathematics & sciences knowledge.

CLO 2: Solve scientific or engineering problem using numerical knowledge with computer programming.

CLO 3: Illustrate solutions using appropriate digital tools and platform.

BTD1251

Mechanical Laboratory 2

Credit Hour: 1

Prerequisite: None

Synopsis

This course introduces 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, welding and sheet metal 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, welding and sheet metal fabrication.

CLO 2: Demonstrate the mechanical laboratory works.

CLO 3: Demonstrate leadership and teamworking in group project.

BTD2113

Product Development 2

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces graphical communications, technical 2D drawing, 3D part modelling, components assembly and surface design using 3D CAD software. It also includes knowledge and techniques to render the 3D model and preparing a presentable graphics. This course also includes rapid prototyping (3D printing) process and measurement techniques as a simulation to the process involved in the part approval stage. Simple programming will be applied in their group prototype (i.e. embedded sensor in the prototype). Students work both individually and in teams.

Course Learning Outcome

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

CLO 1: Apply basic knowledge of 2D product design sketching.

CLO 2: Construct standard drawing relating to design in 3D.

CLO 3: Demonstrate the standard industrial design drawing for product development.

CLO 4: Integrate 3D printed parts of a prototype in the group design project.

BTD2123

Fluid Mechanics

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the principle, properties and basic methods of fluid mechanics, and provide some understanding and analysis of some problems related to fluid mechanics. The course covers topics such as concept of pressure and flow with its application, stability of floating bodies, fluid in motion analysis, flow measurement devices, fluid friction in piping system, flow over immersed bodies, boundary layer analysis, and pumps. Students are also required to conduct laboratory activities and mini project dealing with course outcomes.

Course Learning Outcome

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

CLO 1: Apply the basic principles and applications of fluid statics and fluid dynamics.

CLO 2: Analyze problems related to flow in pipes, external flow, pump and system.

CLO 3: Demonstrate as an effective team work to solve problems related to fluid mechanics.

CLO 4: Present fluid mechanics projects.

BTD2133

Strength of Materials

Credit Hour: 3

Prerequisite: Statics

Synopsis

This course introduce the concepts in strength of materials, stress, strain and deformation under axial load, stress concentrations, torsional shear stresses for circular shaft and bending stresses. Design and beam analysis is 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: Thermodynamics

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 Finite Element software.

Course Learning Outcome

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

CLO 1: Describe basics of FEM in mechanical engineering.

CLO 2: Design an appropriate FE model based on real world problems by using FE software.

CLO 3: Analyze and evaluate accuracy of FE model.

BTD3124

Product Development 5

Credit Hour: 4

Prerequisite: Product Development 4

Synopsis

This course requires students to study and implement the most economical fabrication/manufacturing/maintenance processes of their prototype based on the idea of design for manufacture and assembly principles. Fabricated prototype must undergo series of testing and demonstration in the relevant environment/expected environment to meet the requirements of technology readiness level TRL 6. Rectification and improvisation work of the prototype has to be conducted in the most economical and practical ways to address the issues encountered during the testing/demonstration.

Course Learning Outcome

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

CLO 1: Ability of solving broadly defined engineering and technology problem

during fabrication and integration.

CLO 2: Application of design simplicity through design for manufacture and assembly concept to address cost effective product, good demonstration of management, business practices and entrepreneurship.

CLO 3: Demonstrate an awareness of and consideration for societal, health, safety, legal and cultural issues and their consequent responsibilities. Prototype/product developed meets the requirements of community/society in needs or addressing industrial/agencies genuine problem.

CLO 4: Function effectively as individuals, and as members or leaders in diverse technical teams.

CLO 5: Documented or logged activities of fabrication, troubleshooting, and reports for future references, for professional development and to engage in independent and lifelong learning.

BTD3222

Internship Preparation

Credit Hour: 2

Prerequisite: None

Synopsis

This training provides students with industrial preparation and exposes student to professional skills and experience in mechanical engineering technology practice. Student will apply matured negotiation and excellent interpersonal attitude during training.

Course Learning Outcome

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

CLO 1: Describe basic professional engineering technology skills in industry level and relate to theory that had been learned during study such as planning, design, construction and management in courses.

CLO 2: Demonstrate interpersonal skills and matured negotiation surrounding with excellent ethics and responsible to the

creator.
CLO 3: Practice professional engineering skills required in the industry.

BTD4112
Final Year Project
Credit Hour: 12
Prerequisite: None

Synopsis

This course is the first stage of Final Year Project which involves preliminary study and planning on a project. The aim of this course is to identify problems and proposing appropriate solutions. It is designed to expose the students in writing a research proposal which emphasizes on the research methodology. At the end of the course, students should be able to plan and execute their project according to the given period as well as to write the research report.

Course Learning Outcome

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

- CLO 1: Initiate practical engineering skills required in the industry.
- CLO 2: Explains effectively either orally or in written form.
- CLO 3: Organize work according to plan using available resources.
- CLO 4: Integrate into society and environment for sustainable development.
- CLO 5: Combine interpersonal skills with professional ethics.
- CLO 6: Practice current experience for better of mankind.
- CLO 7: Design and development of engineering system.

BTD4122
Professional Practice and Ethics
Credit Hour: 2
Prerequisite: None

Synopsis

This course introduces the engineering

profession, engineers and research, ethics and public responsibility, engineer and law, engineers and design ethics and contract law.

Course Learning Outcome

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

- CLO 1: Describe the understanding of engineering profession, accreditations and professional bodies.
- CLO 2: Demonstrate ethics, public responsibility and the laws apply in engineering practice.
- CLO 3: Explain the understanding of sustainable engineering, ethics in research and design.
- CLO 4: Organize the effective leadership and teamworking ability in completing the report and presentation.

BTD4131
Occupational Safety and Health
Credit Hour: 1
Prerequisite: None

Synopsis

The course aims is to familiarize students to the engineering safety principles. The students will be introduced to OSHA 1994 and Factories and Machinery Act 1967 focuses on specific aspects of occupational health and safety managements. At the end of the course, the students are expected to be able to practice occupational safety and health knowledge especially in the manufacturing, construction, oil and gas industries, such as preparing health and safety strategies and developing internal policies as well as leading in-house training on safety and health issues and risks.

Course Learning Outcome

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

- CLO 1: Explain the overview of national

safety based on OSHA Act 1994 and FMA 1967.

CLO 2: Explain the hazard identification, risk assessment and risk control on general duties and critical condition.

CLO 3: Demonstrate OSH legal requirements and plan its OSH programs and its impact on society based on Factories and Machineries Act and hazard classification.

BTD4212

Industrial Training

Credit Hour: 12

Prerequisite: Internship Preparation

Synopsis

This course exposes students to professional skills and experience in industrial company or related aspect. Students involved in actual project of the company from product development to process and distribution. The projects studied by the students deal with topics from elective subject acquired at the university. Students are responsible to find a suitable project at the training company. With this exposure, it will help to produce excellent, responsible and good attitude graduates.

Course Learning Outcome

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

CLO 1: Initiate practical engineering skills required in the industry.

CLO 2: Explains effectively either orally or in written form.

CLO 3: Organize work according to plan using available resources.

CLO 4: Integrate into society and environment for sustainable development.

CLO 5: Combine interpersonal skills with professional ethics.

CLO 6: Demonstrate team work and leadership skills to solve problems in companies.

CLO 7: Practice current experience for better of mankind.

CORE COURSES FOR BTD

BTD2663

Elements of Mechanical Design

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the failure theories under static and variable loadings, machine elements/components including shafts, springs, bolts and nuts, screws, welding, bearings, gears and belts. Students will be exposed to the important features of these elements, methods of analyzing and designing them.

Course Learning Outcome

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

CLO 1: Analyze the components to prevent failure due to static and variable loads.

CLO 2: Evaluate the stresses in machine elements under various loads.

CLO 3: Explain a mechanical structure design involving machine elements such as shaft, gears, bearing, fastener, belt and spring.

BTD3133

Ergonomics and Human Factors

Credit Hour: 3

Prerequisite: None

Synopsis

The Ergonomics and human factors course is concerned with the achievement of optimal relationships between humans and their work environment (human factors design). Emphasis will also be on design and analysis of occupational systems and consumer products which best "fit" job tasks or user requirements to human capabilities.

Course Learning Outcome

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

CLO 1: Identify the physiology and psychology of human behavior as it relates to workplace safety.

CLO 2: Construct the consumer product/equipment design based on ergonomic and human factors requirements using CAD Software.

CLO 3: Explain appropriate controls to overcome ergonomic hazards.

CLO 4: Propose the work place environmental design that relate the human and workplace factors which contribute to ergonomic hazards.

BTD3233

Computational Fluid Dynamics

Credit Hour: 3

Prerequisite: Fluid Mechanics

Synopsis

This course will cover the introduction of computational fluid dynamics (CFD) by demonstrating how various fluid mechanics problems can be simulated. The students will be exposed to the fundamental theory of CFD through a governing equation. After that, the students will learn step by step in the pre-processing and post-processing phases needed to solve basic fluid problems such as internal flow, external flow and heat transfer flow. Then, the students will be facilitated on how to simulate various fluid problems, to extract and demonstrate the numerical solutions.

Course Learning Outcome

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

CLO 1: Explain fundamental of fluid flow and computational fluid dynamics (CFD).

CLO 2: Perform CFD pre-processing phase by designing and describing the basic model, choosing the right boundary conditions and the solver.

CLO 3: Demonstrate post-processing stage of CFD by extracting and analyzing an appropriate numerical solution.

CLO 4: Solve fluid mechanics problems using CFD software in a group project.

BTD3243

Stress Analysis

Credit Hour: 3

Prerequisite: Finite Element Analysis

Synopsis

This course introduces computational mechanics for the analysis of solid and structural problem where static and dynamic loadings are considered. Finite element methods and solution procedures are presented in this course. The stress analysis using FEM is a powerful method in computational mechanics for computing the displacements, stresses and strains in a structure under a set of loads. Applications include finite element analyses, modeling of problems, and interpretation of simulation results.

Course Learning Outcome

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

CLO 1: Investigate the stresses, strains and fatigue in a structure under a set of loads.

CLO 2: Perform finite element simulation to predict fatigue life.

CLO 3: Analyze fatigue life on engineering structure.

CLO 4: Prepare project report on analysis of fatigue life.

ELECTIVE COURSES FOR BTD

BTD3323

Production Planning and Control

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces planning and control, forecasting, aggregate planning, production scheduling, just-in-time production, inventory management, material requirements planning. Simulation on production operation using Witness software is assigned.

Course Learning Outcome

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

CLO 1: Evaluate forecasting method using qualitative and quantitative methods.

CLO 2: Evaluate the aggregate planning using level, chase and transportation methods.

CLO 3: Describe the best solution using Lean manufacturing and material requirement planning.

CLO 4: Analyze a new production layout by using Witness software.

BTD3333

Mechanics of Composite Materials

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces students to current views and theories in polymer based composite materials, on the types of materials, production methods, quality assurance, failure analysis, test methods and the mechanics of lamina and laminated composites.

Course Learning Outcome

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

CLO 1: Explain different types of composite materials, production methods to produce polymer matrix composites and the main properties of a lamina and the laminated of composite materials.

CLO 2: Compare the failure modes of composites and evaluate different type of failure criterions in laminated composites, and composite materials in the future.

CLO 3: Describe mechanical test/simulation on laminated composites.

BTD3343

Fatigue Design and Analysis

Credit Hour: 3

Prerequisite: None

Synopsis

Introduction to factors affecting fatigue behavior and characteristics of design approach. Study on cycle counting techniques. Fatigue design methods including stress life, strain life and linear elastic fracture mechanics methods under constant and variable amplitude loading.

Course Learning Outcome

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

CLO 1: Apply fatigue design criteria.

CLO 2: Evaluate a component under fatigue loading.

CLO 3: Construct Finite Element Analysis for fatigue design.

BTA3313

Automotive Product Development

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the concept of automotive product development process. It covers the research and development process, stages of tooling process, production line process as well as the quality system used in automotive production line.

Course Learning Outcome

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

CLO 1: Explain the research and development process of automotive product and its organization.

CLO 2: Compare the tooling process in products development based on parts function.

CLO 3: Justify the manufacturing process flow in car production line based on safety and human factors.

CLO 4: Identify the effect of manufacturing process on the quality of the production parts.

BTA3323
Automotive Advance Technology
Credit Hour: 3
Prerequisite: None

Synopsis

This course is the advance construction, development and operational analysis of the state-of-the-art vehicle system which including engine advance control system for higher efficiency, lower emission, advance suspension for excellent ride and comfort, advance driveline for spacious, precision, minimum slips control, advance material for lighter, cheaper and stronger component, chassis and body, advance energy powering system for renewable and sustainability future and advance vehicle mobility control.

Course Learning Outcome

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

CLO 1: Compares the antilock braking, vehicle aerodynamics, tire tread design advances.

CLO 2: Combines electronically controlled anti-vibration engine mountings and transport refrigeration.

CLO 3: Differentiate electricity, alcohol, and hydrogen fuel cells, as well as advanced additives and oils, in environmentally sustainable transport.

CLO 4: Explain of engine diagnosis and troubleshooting of automotive engine control systems including digital storage

oscilloscopes, fuel injection and ignition system diagnoses, five-gas exhaust analysis and emission testing. Generate Seat belts, brake lights, and air bags, of safer vehicles and fewer fatalities.

BTA3333
Energy Efficient Vehicle
Credit Hour: 3
Prerequisite: Automotive Powertrain

Synopsis

Energy Efficient Vehicle or EEV is a new concept of categorize automotive technology towards the low fuel consumption, alternative and sustainable automotive system. Under the EEV definition, there are multiple approaches, technology, alternative fuels, materials and etc. In this course, some foundation of automotive highlighted and followed by sustainability of different green technology, electrification and detail hybrid electric vehicle design, operation, construction and diagnosis.

Course Learning Outcome

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

CLO 1: Evaluate the evolution of automotive electrification and technology sustainability.

CLO 2: Analyze the design of various energy efficient vehicle technology combination.

CLO 3: Summarize the architecture of different hybrid electric vehicle, safety design and influent of local policy and enforcement.

CLO 4: Analyze the construction and operation mechanism for hybrid electric vehicle low voltage, high voltage system,

and its performance under different fault code driving condition.

BTA3343
Motorsport Engineering
Credit Hour: 3
Prerequisite: None

Synopsis

This course focuses on the introduction to motorsports engineering, types of racing engines, advanced vehicle materials and structure, and manufacturing technique extant in this field. It also covers the modification as enhancement in motorsport system feature, racing theories and strategies, regulation and safety in motorsports engineering.

Course Learning Outcome

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

CLO 1: Appraise the fundamental of motorsports engineering in the basis of racing theories, strategies, regulations, and safety.

CLO 2: Evaluate the advancement of motorsport in the aspect of advanced materials and structure usage and modification techniques.

CLO 3: Evaluate the advancement of motorsport in the aspect of manufacturing techniques utilize in the production of components and parts for motorsports.

BTG3533
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.(C4,PLO1)

CLO 2: Evaluate the stresses in machine elements under various loads. (C5, PLO3)

CLO 3: Explain a mechanical structure design involving machine elements such as shaft, gears, bearing, fastener, belt and spring.(A4, PLO4)

BTG3543
Tank Design
Credit Hour: 3
Prerequisite: None

Synopsis

This course provides a comprehensive understanding of aboveground storage tanks (ASTs) in the oil and gas industry, focusing on design, operation, and compliance with API 650 and 653 standards. Students will explore AST components and materials, learn to design tanks per API 650, master inspection and repair techniques following API 653, and grasp safety and environmental considerations. Real-world case studies and a final project will reinforce skills in designing, maintaining, and assessing ASTs, enabling students to contribute effectively to the industry's safe and efficient tank practices.

Course Outcome

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

CLO1: Identify the importance of

aboveground storage tanks and the role of API standards in their design and operation (C4, PLO1)

CLO2: Evaluate various tank components, understand material selection criteria, and familiarize with welding practices (C5,PLO1)

CLO3: Design and construct the tanks, calculate key parameters, and comprehend fabrication processes based on API 650 guidelines (C5,PLO3)

CL04: Analyze tank conditions, perform inspections, identify defects, and propose appropriate repair and alteration methods according to API 653.(C4, PLO3)

BTG3553

Asset Reliability Practitioner

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces a comprehensive understanding of asset reliability principles and practices. This course will cover key topics related to ensuring the availability, performance, and longevity of critical assets in various industries. Through a combination of lectures, case studies, hands-on exercises, and real-world examples, students will gain the knowledge and skills necessary to become effective asset reliability practitioners.

Course Outcome

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

CLO1: Identify the understanding of asset reliability principles and applications across diverse industries. (C4, PLO1)

CLO2: Evaluate asset reliability strategies based on reliability-centered maintenance (RCM) principles and predictive maintenance techniques to improve asset performance. (C5,PLO3)

BTG3563

Boiler and Steam Engineers

Credit Hour: 3

Prerequisite: None

Synopsis

This subject covers boilers, and steam engineers requirement according to act and legislation, risk Assessment and control, policy and procedure. It is a course that design to provide knowledge to manage safety, operation and maintenance elements in the boilers and power plant workplace. It includes policy, objectives, plans, procedures, organisation, responsibilities and other relevant measures.

Course Outcome

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

CLO1: Identify codes, Standard and relevant Laws related to Steam Boilers (C4, PLO1)

CLO2: Explain the boilers application, its efficiency, design and related application (C4,PLO1)

CLO3: Suggest control method or procedure to operate and troubleshoot boilers application during operation and maintenance (C5,PLO3)

CLO4: Suggest control method and procedure of 13 essential fittings, types of combustion, water treatment and related steam boiler inspection, maintenance and repairs.(C4, PLO3)

**CURRICULUM STRUCTURE
BACHELOR OF AUTOMOTIVE ENGINEERING WITH HONOURS**

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		BHA2313 Microcomputer Technology	BHA3402 Vehicle Electronics	BHA3912 Internship	BHA4223 Energy Efficient Vehicle	BHA4902 Preparations for Bachelor Thesis	
	BHA1103 Statics	BHA2123 Mechanics of Materials		BHA2342 Technical Informatics 1	BHA2403 Manufacturing Processes		BHA3523 Mechanical Vibrations	BHA3323 Automatic Control	BHA3931 Internship Follow-up	BHA4704 Team Oriented Project Study	BHA4904 Bachelor Thesis	
	BHA1602 Technical Drawing	BHA2612 Computer Aided Design		BHA2613 Machine Elements	BHA2533 Fluid Mechanics		BHA3602 Automotive Product Development	BHA4224 Automotive Engineering		BHA4611 Introduction to Autonomous Driving	BHA4931 Final Examination (Viva)	
	BHA1801 Experimental Laboratory	BHA1421 Mechanical Laboratory			BHA2021 Occupational Safety & Health		BHA3921 Engineers and Society	BHA3533 Thermodynamics and Heat Transfer		BHA4311 Actuators 2 ECTS		
	BHA1021 Technical Communication				BHA3413 Fundamentals Electrical Engineering 2		BHA3012 Numerical Programming	BHA3302 Sensors		BHA4*32 Specialization 3		
	BUM2143 Applied Calculus	BUM2153 Ordinary Differential Equations		BUM2443 Applied Statistics			BHA3922 Internship Preparation	BHA3011 Quality Management		BHA4*42 Specialization 4		
					UGE2002 Technopreneurship		BHA4022 Project Management	BHA4*12 Specialization 1				
	UHC1042 Falsafah dan Isu Semasa	UQA2002 Co-Curriculum		UHS1022 Soft Skills	UHC2032 Penghayatan Etika dan Peradaban		BHA3313 Signals and Systems	BHA4*22 Specialization 2				
	UHD2313 German A1	UHD2323 German A2	UH2333 German B1.1	UHD2343 German B1.2	*UHG2353 German B2.1	*UHG2363 German B2.2						
*Optional	TOTAL CREDIT	18	17	3	16	16 (*19)	*3	18	18	13	13	7
	TOTAL CREDIT FOR GRADUATION	140										

609

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)	
PEO1	Graduates are competent, responsible and practice professionalism in the global context.
PEO2	Graduates are knowledgeable and capable to apply the evolving technology in mechanical and automotive engineering field.

PROGRAMME OUTCOMES (PO)	
Following are the 12-PO for the degree of BHA, where by the end of the programme the students are able to:	
PO1	(Engineering knowledge) An ability to apply knowledge of mathematics, natural science, engineering fundamentals and an automotive engineering specialisation as specified in WK1 to WK4 respectively to the solution of complex engineering problems. [C]
PO2	(Problem analysis) An ability to identify, formulate, research literature and analyze complex automotive engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. (WK1 to WK4) [C].
PO3	(Design/ development of Solutions) An ability to design solutions for complex mechanical-automotive engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations. (WK5) [C].
PO4	(Investigation) An ability to conduct investigations of complex problems using research-based knowledge (WK8) and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions. [C].
PO5	(Modern tool usage) An ability to create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex automotive engineering problems, with an understanding of the limitations. (WK6) [P].
PO6	(The engineer and society) An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice and solutions to complex engineering problems. (WK7). [A]
PO7	(Environment and sustainability) An ability to understand and evaluate the sustainability and impact of professional engineering work in the solution of complex engineering problems in societal and environmental contexts. (WK7) [A].
PO8	(Ethics) An ability to apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice. (WK7) [A].
PO9	(Communication) An ability to communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions. [A].
PO10	(Individual and team work) An ability to function effectively as an individual, and

	as a member or leader in diverse teams and in multi-disciplinary settings. [A].
PO11	(Lifelong learning) An ability to recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. [A].
PO12	(Project management and finance) An ability to demonstrate knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. [A].

COURSE SYNOPSIS

COURSE SYNOPSIS FOR BACHELOR OF AUTOMOTIVE ENGINEERING WITH HONOURS (BHA)

BHA1113
Engineering Materials
Credit Hour: 3
Prerequisite: None

Synopsis

This course introduces students to the engineering materials fundamentals, including the engineering materials application, atomic bonding, crystal structure, mechanical and physical properties, corrosion mechanism, microstructural analysis, phase diagram, ferrous and non-ferrous alloys, and polymer and advance materials.

Course Outcome

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

Analyse and illustrate the materials' atomic bonding and crystal structure.
Evaluate and explain the mechanical, physical properties of engineering materials and the concept of corrosion and metal alloys microstructure, phase diagram, and heat treatment processes.
Evaluate and explain ferrous and non-ferrous alloy microstructure strengthening mechanisms and their applications.
Analyse the polymeric materials and advanced materials classification, structure, and properties.

BHA1103
Statics
Credit Hour: 3
Prerequisite: None

Synopsis

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

Course Outcome

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

Analyse equilibrium of particle and rigid body.
Evaluate equilibrium of rigid body involve friction and structural analysis.
Evaluate centroids and moment of inertia of composite cross-sectional area.

BHA1602
Technical Drawing
Credit Hour: 2
Prerequisite: None

Synopsis

This course introduces technical drawing and engineering drawing base on BS 8888. It consists of basic shapes, tangencies, curves of intersection, and orthographic views, including sectioning, auxiliary view, isometric view, geometric dimensioning and tolerancing, and detail assembly drawings.

Course Outcome

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

Analyse tangencies, basic shapes, and sketching of engineering components.
Evaluate orthographic view and sectional view with dimensioning.
Analyse auxiliary view, curve of intersection and isometric drawing.
Analyse knowledge to use for geometric dimensioning and tolerancing and assembly drawing with Bill of Materials.

BHA1421
Mechanical Laboratory
Credit Hour: 1
Prerequisite: None

Synopsis

This course will introduce students to shop safety, reading blueprint, metrology including linear measurement, angular measurement, dial indicator, gauge block and profiler projector, and benchwork including marking

out, manual sawing, filing, chiseling, drilling, tapping and grinders. Furthermore, students will be exposed to turning machines, including tools, clamping and operation, and milling machines, including cutter, mounting and operation. Emphasis is placed on the operation of lathe machines and milling machines.

Course Outcome

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

Analyse appropriate techniques and procedures to operate common tools in the mechanical laboratory.

Perform appropriate techniques and procedures to operate common tools in the mechanical laboratory.

Practice reasoning informed by contextual knowledge of techniques and procedures to operate common tools in the mechanical laboratory.

Demonstrate excellent teamwork and team cooperation during performing activities in the mechanical laboratory.

BHA1021

Technical Communication

Credit Hour: 1

Prerequisite: None

Synopsis

In this course, students learn how to approach technical communication for various audiences, purposes, and contexts. The course emphasises foundations for creating technical communication documents used for selecting and planning a computer science project for an actual client. Course assignments will integrate written, oral, visual, electronic, and nonverbal (WOVEN) rhetorical skills to help students thrive in the modern workplace.

Course Outcome

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

Evaluate the governing principles in technical communications and strategising for effective communicate within modern and global technical ecosystems.

Manipulation of the modern tools in planning,

preparation and production of various technical documents serving a broad spectrum of readers and purposes with contrasting background.

Assessment of techniques in preparing and delivering the presentation materials for effective communicative outcomes among partners and shareholders.

Investigate, determine, and formulate the modern tools in technical communication as a preparation for professional career progression.

BHA1801

Experimental Laboratory

Credit Hour: 1

Prerequisite: None

Synopsis

This course includes enhancing mastery of engineering subject matter, developing scientific reasoning abilities, increasing understanding of the complexity and ambiguity of empirical work, developing practical skills, increasing understanding of the nature of engineering, cultivating interest in engineering learning, and improving teamwork abilities.

Course Outcome

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

Analyse basic manual/ procedure experiment techniques.

Determine appropriate problem-solving approach according to given experiment requirement.

Evaluate the solutions within safe working habits.

Deliver the experiment outcomes individually and in teamwork.

BHA1413

Fundamentals Electrical Engineering 1

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces DC resistive network analysis, AC network analysis, diodes, bipolar junction transistors (BJT), operational amplifier (op-amp) and digital logic circuits.

Course Outcome

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

Evaluate DC resistive and AC network analysis.
Evaluate circuits involving diodes, bipolar junction transistor (BJT) and operational amplifier
Integrate solutions to solve simple logic circuits problem.

BHA2123

Mechanics of Materials

Credit Hour: 3

Prerequisite: BHA1113 Engineering Materials

Synopsis

This course introduces the concept of stress and strain under axial, torsion, bending, and transverse shear and combined loadings in elastic structural members. Plane stress transformation is also included.

Course Outcome

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

Evaluate the stress and strain in structural members subjected to axial loads and torsion loads.
Evaluate the stress and strain in structural members subjected to bending loads and shear loads.
Construct stress and strain in structural members subjected to combined loads and conduct the stress transformation.

BHA2612

Computer Aided Design

Credit Hour: 2

Prerequisite: BHA1602 Technical Drawing

Synopsis

This course introduces the types of fastener and spring types, AutoCAD, 2 – D drawing command, coordinate system, organising the drawing, AutoCAD drawing setting, Introduction to Solid Works, 3 – D solid modeling, 3 – D drawing, Blueprint drawing, 3 – D functioning and organising, Solid Works Animator.

Course Outcome

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

Analyse drawing information in CAD and Solid Works
Evaluate 2-D drawings using AutoCAD and 3-D solid modeling using Solidworks.
Prepares mechanical engineering parts using learned software

BHA1133

Dynamics

Credit Hour: 3

Prerequisite: BHA1103 Statics

Synopsis

This course introduces the principles of kinematics of a particle and a planar rigid body, kinetics of a particle and a planar rigid body utilising force and acceleration method, work and energy method and impulse and momentum method.

Course Outcome

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

Evaluate and solve problems involving the kinematics of a particle.
Evaluate and solve problems involving kinetics of a particle utilising force and acceleration method, work and energy method and impulse and momentum method.
Create solutions involving kinematics of a planar rigid body and kinetics of a planar rigid body utilising force and acceleration.

BHA2342

Technical Informatics 1

Credit Hour: 2

Prerequisite: None

Synopsis

This course introduces input and output, variables, constants, arithmetic operations and mathematical functions, user-defined functions, selection of decision-making and repetitive construct, and array data structure. The programming language used for the course is C language.

Course Outcome

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

Evaluate C program using variables, constants declarations, arithmetic operations, mathematics function, selection of decision-making involving construct and loops.
Evaluate C program using user-defined functions, numeric arrays and develop C programmes for engineering applications.

BHA2021

Occupational Safety & Health

Credit Hour: 1

Prerequisite: None

Synopsis

This course introduces OSH in Malaysia, identification, types and inspection of industrial hazard, analysis and control of industrial hazard, mechanical hazard, chemical hazard, physical hazard, psycho-social hazard, industrial hygiene, accident causation phenomenon, accident investigation and analysis, managing safety and health, and industrial safety and health regulation.

Course Outcome

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

Identify OSHA regulations and its implementation in Malaysia
Analyse industrial hazards and industrial hygiene programs
Identify causation of accident phenomenon, accident investigation and analysis
Integrates lifelong learning for safety and health management

BHA2403

Manufacturing Processes

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces the various type of manufacturing processes including metal casting processes, forming and shaping processes for metal, plastics and composites, material removal processes, joining processes and finishing processes.

Course Outcome

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

Evaluate metal-casting processes and forming processes
Evaluate material removal processes and joining processes
Identify the appropriate surface technology processes for advanced applications

BHA2533

Fluid Mechanics

Credit Hour: 3

Prerequisite: None

Synopsis

After successfully completed the course, the students should have basic knowledge of one-dimensional flows of incompressible fluids, be able to evaluate the effect of flow circulation on bodies and understand energy loss in the flow process.

Course Outcome

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

Describe and evaluate the basic principles and applications of various fluid conditions discussed in Fluid Mechanics 1.
Devise solutions for problems in fluid statics, dynamic pipe flow, flow measurement and dimensional analysis.
Evaluate problems related to fluid mechanics

BHA2613

Machine Elements

Credit Hour: 3

Prerequisite: None

Synopsis

Introduction to design process. Study of static and dynamic loading resulting normal and shear stresses, principles stresses. Engineering materials, static and fatigue failure theories. Machine element design including screws, bolts, fasteners, welded joints, keys and coupling and springs.

Course Outcome

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

Identify loading of the machine elements, stress and fatigue failure and to perform deformation and stress analysis to design safe machine components

Evaluate design shafts, keys, coupling, gear and spring to meet desired specifications, mechanical elements for non-permanent joint including screws, bolts, fasteners, keys and coupling to meet desired specifications and permanent joints

Organise and coordinate a team to design mechanical components.

BHA3602

Automotive Product Development

Credit Hour: 2

Prerequisite: None

Synopsis

This course introduces the concept of product development process and organisations, product planning, identifying customer needs, product specifications, concept generation, concept selection, concept testing, industrial design, prototyping, patents and intellectual properties.

Course Outcome

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

Evaluate product development process, organisation, planning stages, and process of identifying customer needs in product development.

Evaluate establishing the target specification, refining the specification process and design, select and perform testing analysis.

Display professional engineering practice in contextual knowledge.

BHA2313

Microcomputer Technology

Credit Hour: 3

Prerequisite: None

Synopsis

This course is an introduction to PLC and microcontroller. Students are exposed to input/output PLC interface, PLC programming, input/output microcontroller

interface and microcontroller programming.
Course Outcome

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

Evaluate input/output of PLC interfacing and PLC programming.

Evaluate input/output of microcontroller interfacing and microcontroller programming.

Construct actuator and signal device through programming and interfacing

BHA3012

Numerical Programming

Credit Hour: 2

Prerequisite: BUM 2413 Applied Statistics

Synopsis

This course covers how to handle the numeric standard tools MATLAB and Simulink Solution of differential equations and modeling simple dynamic systems with MATLAB and Simulink.

Course Outcome

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

Creates programmes using the numeric software MATLAB,

Evaluate numerical programme to solve engineering-related problems and construct programmes to simulate dynamic systems

BHA3313

Signal and Systems

Credit Hour: 3

Prerequisite: None

Synopsis

This course covers topics under signals: energy and power signals, discrete-time and continuous, linear systems and convolutions, Fourier transform, complex Fourier series; signal spectral properties and bandwidth, Laplace transform and transient analysis. Emphasis is also given to transfer functions, block diagrams, baseband and pass band signals with applications to communications systems. Matlab and Simulink is used as the tool for simulation and application.

Course Outcome

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

Evaluate the sampling theorem, its meaning and consequences for signal processing, understand the characteristic of stochastic signals and fundamental methods of stochastic signal analysis.

Develop description and design of analogue linear time invariant systems using appropriate tools

Characterise and design digital linear analogue linear time invariant systems using appropriate tools.

BHA3342

Technical Informatics 2

Credit Hour: 2

Prerequisite: BHA 2342 Technical Informatics 1

Synopsis

This course cover topics under software process, software requirements, analysis, design concepts, and principles. By completing this subject, the student will be able to explain the software engineering principles and techniques that are used in developing quality software products.

Course Outcome

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

Propose a broad range of concepts from software engineering, spanning all aspects the software engineering process and use of accepted software engineering terminology

Develop a software for engineering project by applying a representative cross-section of software engineering techniques

BHA 3413

Fundamentals Electrical Engineering 2

Credit Hour: 3

Prerequisite: BHA1413 Fundamentals Electrical Engineering 1

Synopsis

This course cover topics with comprehensive knowledge in the area of automotive mechatronics and familiarises students with both analytical and computational approaches in evaluating and designing vehicle electrical

and electronics components and systems as well as future automotive electronics systems.

Course Outcome

Evaluate the principle of designing an electro-mechanical drive-train.

Analyse actuators, power electronics, converters, power supply and control of a vehicle with electrical and electronics equipment.

Integrate electrical and electronics signals and circuit using hardware and software

BHA3921

Engineers and Society

Credit Hour: 1

Prerequisite: None

Synopsis

This course introduces the engineering profession, local industries sector, issues in local industries, ethics and public responsibility, engineer and law, and contract law

Course Outcome

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

Apply engineering profession and code of ethics

Analyse the issues in local industries and public responsibilities

Explain the law which governs the engineering profession

BHA3011

Quality Management

Credit Hour: 1

Prerequisite: None

Synopsis

This course introduces the basics of process-oriented management systems, seven quality tools that have been used for quality improvement such as check sheets, scatter diagrams, cause and effect diagram, pareto charts, flow charts, histograms and statistical process control. Besides that, students are introduced to quality management systems in the automotive industry (TS 16949), international quality standards (ISO 9000 series), and human factor engineering in quality management.

Course Outcome

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

Apply key management concepts, quality and total quality management, Deming's management principles, ISO 9000, application of management tools.

Analyse fundamental knowledge on quality control, engineering, management and basic quality tools

Construct frequency distribution, central tendency, dispersion and population analysis by using statistical analysis method on data

BHA3302

Sensors

Credit Hour: 2

Prerequisite: None

Synopsis

This course covers measurement and test engineering fundamentals - terms such as accuracy, resolution, linearity, reproducibility and error. Physics of different sensors frequently used in automotive applications. Influence of electromagnetic disturbance. Electronic signal processing (usually analogue electronics). Physical fundamentals and functional principles of various (electrical) actuators.

Course Outcome

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

Analyse fundamentals to measurement engineering, electromagnetic compatibility (EMC) and signal conditioning.

Analyse appropriate sensors for measuring temperature, pressure, speed magnetic fields, angle, acceleration, rotation rate and flow, and understand types of actuators and electronic motors.

BHA3323

Automatic Control

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces linear, time-invariant

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

Course Outcome

Develop basic control system concepts and illustrate the required control system into block design process.

Develop frequency domain transfer function of linear, time invariant (LTI) control systems for mechanical system

Develop the transient response, steady-state response and system stability of LTI control system compensators to achieve specified control system performances utilising root-locus technique.

BHA3402

Vehicle Electronics

Credit Hour: 2

Prerequisite: None

Synopsis

This course aims to familiarise students with digital electronics basics and the foundations of the alternating current calculation. In addition, the student will learn the basic knowledge of the energy supply in the automobile, the lighting, and electrical wiring.

Course Outcome

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

Evaluate the fundamental theories alternating variables: Mean value, mean (root mean square) value, average absolute value and master/control superposition of sinusoidal vibrations, the meaning of the complex pointer and to perform the circuit analysis by using complex calculation. To understand simple filter circuits, to design and to build up.

Assess the function of the three - phase generator and the controller in the vehicle and apply correct term of the colour temperature and to understand the usage of different lamp (light source) as well as its functional principles

Manipulate skills to translate logical expressions into electronic circuits, build and

analyse logic circuits and display simple, time-dependent variables in the frequency domain.

BHA3533

Thermodynamics and Heat Transfer

Credit Hour: 3

Prerequisite: None

Synopsis

This course focuses on the application of thermodynamics knowledge in various engineering systems. The subject covers the review and analysis of energy, gas power cycles, vapour power cycles, refrigeration cycles, gas.

mixtures, gas-vapour mixture & air-conditioning, and combustion. This course will also focus on the primary modes of thermal energy transfer, viz., conduction, convection, and radiation are introduced with emphasis on understanding the fundamental concepts to be used in analysing and solving real-life problems.

Course Outcome

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

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

Evaluate the fundamentals of mass balance, 1st law, 2nd law of energy to identify, differentiate and solve engineering problems involving closed,

open systems and unsteady-flow processes.

Evaluate the fundamental concept of conduction, convection, and radiation heat transfer related to one-dimensional heat flow and different geometries.

Integrate design and apply the thermodynamic and heat transfer problem for application in the system of heat exchangers.

BHA3523

Mechanical Vibrations

Credit Hour: 3

Prerequisite: None

Synopsis

This course introduces fundamental of vibration, free vibration response for single, two and multi degree of Freedom, harmonically excited vibration response for

single and two DOF system, vibration absorbers and isolators, whirling of shafts, basics of modal testing, balancing of rotating machines and others vibration measurement techniques.

Course Outcome

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

Synthesise vibrational elements and dynamic behaviour of the mechanical systems.

Formulate the solutions to vibration problems that contain free-vibration and forced-vibration analysis of one, two and multi degree of freedom systems

Justify vibration measurement techniques, tools and methods

BHA3922

Internship Preparation

Credit Hour: 2

Prerequisite: None

Synopsis

This training exposes the students to professional skills and experience in aspects of mechanical engineering practice. The exposure will help to produce an excellent, responsible and good attitude.

Course Outcome

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

Evaluate basic professional engineering skills at the industry level relating to the theory learned during the involvement of real problems solving such as planning, design, construction and management of the projects. Devise a practical problem that exists, identify the company or department structure and recognise the job scope of specific post in the organisation.

Integrate interpersonal skills with professional ethics to be excellent, motivated and responsible to the creator.

BHA3912

Internship

Credit Hour: 2

Prerequisite: None

Synopsis

This course is the practical task in an industrial company or related with the appropriate training for the duration of 95 days. The student involved in actual project of the company from the fields of development, production or distribution. The projects studied by the students deal with topics from the vehicle technology and related fields and allow the practical application of the knowledge acquired at the university. It provides an insight view to the future professional life. The students are responsible to find a suitable project at the training company.

Course Outcome

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

Evaluate professional engineering skills required in the industry

Evaluate the theory that had been learned during the involvement of real problems solving such as planning, design, construction and management of the projects.

Organise practical solution for problems in companies or department and recognise the job scope of specific post in the organisation.

Integrate interpersonal skills with professional ethics to be excellent, motivated and responsible to the creator

BHA3931

Internship Follow Up

Credit Hour: 1

Prerequisite: None

Synopsis

This training exposes the students to professional skills and experience in aspect of mechanical engineering practice. The exposure will help to produce an excellent, responsible and good attitude.

Course Outcome

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

Relates the theory that had been learned during the involvement of real problems and practice basic professional engineering skills at industry level solving such as planning, design, construction and management of the projects

Evaluate solutions to practical problems in

companies or department structures and recognise the job scope of specific post in the organisation.

BHA3223

Internal Combustion Engine

Credit Hour: 3

Prerequisite: None

Synopsis

This course provides the foundation understanding on the fundamental of internal combustion engine which includes the kinematics of combustion engine, the charge cycle and mixture formation in engine, the combustion process in engine, various combustion processes, such as petrol, diesel and HCCI engines. This course will also cover charging methods in internal combustion and the effect of combustion engine to the environment

Course Outcome

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

Construct engine performance and engine combustion design using fundamental principles of thermodynamics, construction elements and parameters.

Combining performances using knowledge from exhaust treatment, ignition, cooling and lubricant, charge cycle, combustion and mixture formation for diesel and gasoline engine, combustion engine and crank mechanism

Compiling engine performance using detail analysis to understand combustion and mixture formation for diesel engine, gas exchange process (supercharging/turbocharging)

Organising the impact of professional engineering solutions in the engine types, instrumentation and conduct the actual analysis of engines.

BHA4223

Energy Efficient Vehicle

Credit Hour: 3

Prerequisite: None

Synopsis

This course provides a new concept of categorising automotive technology towards

the low fuel consumption, alternative and sustainable automotive system. Under the EEV definition, there are multiple approaches, technology, alternative fuels and materials, among others. In this course, some foundations of automotive highlighted and followed by the sustainability of different green technology, electrification and detail hybrid electric vehicle design, operation, construction and diagnosis.

Course Outcome

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

Evaluate the evolution of automotive electrification and technology sustainability.
Analyse the design of various energy-efficient vehicle technology combination.
Summarise the architecture of different hybrid electric vehicles, safety design and influent of local policy & enforcement.
Evaluates the construction and operation mechanism for hybrid electric vehicle low voltage and high voltage systems, thus analysing its performance under different fault code driving conditions.

BHA4224
Automotive Engineering
Credit Hour: 4
Prerequisite: None

Synopsis

This course provides the complete foundation and working principles on the automotive engineering which including vehicle dynamics, powertrain, auxiliary system, vehicle safety, HVAC, drivetrain, tires, suspension, steering, braking unit and active safety system. In addition, significant projects are match with fundamental topics for practical utilisation of techniques, skills and tools to solve engineering issues.

Course Outcome

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

Develop foundation knowledge and parameters of vehicle dynamics analysis & calculation.
Evaluate the performance characteristic of vehicle dynamics topics under various driving circumferences
Compile and evaluate powertrain designs,

engine cycles and digital engine control parameters while analysing engine testing and performance parameters.
Demonstrate understanding drivetrain designs, gear selections, traction diagram, body control and alternative powertrains.

BHA4311
Actuators
Credit Hour: 1
Prerequisite: None

Synopsis

This course provides the lecture with integrated exercise on the topic of electrical actuators in the area specific on small drives. The focus is on small powered electromagnetic actuators. It will focus on the physical basics, the functional principles, the design, and electrical control of various actuators are included. This lecture deals with the basics of electromagnetic fields, magnetic forces, electromagnets, the brushed and the brushless permanent magnet excited DC motor and its electrical control.

Course Outcome

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

Evaluate motors and actuators for driving a mechanical or automotive system by accurately describe and use simple DC motor, brushless DC motor, stepper motors and servo motors.
Design a solution for driving electric motors in solving a mechanical or automotive problem with appropriate selection of power sources for driving the actuator circuits.

BHA4611
Introduction to Autonomous Driving
Credit Hour: 1
Prerequisite: None

Synopsis

This course provides the lecture with integrated exercise that shows the boundary conditions for development and the infrastructure of autonomous vehicles. Priority requirements in development process such as requirements engineering, testing and functional safety are taught in theory and with practical examples. In the lab exercise, the

students develop and implement computer vision algorithms as they are used in autonomous Vehicles.

Course Outcome

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

Evaluate foundation knowledge and parameters of autonomous vehicle.

Evaluate the performance characteristic of autonomous driving with computer vision algorithms.

Analyse powertrain designs, engine and digital engine control parameters while analysing the performance autonomous vehicle.

Investigate the advantages and disadvantages of developed computer vision algorithms.

BHA4704

Team Oriented Project Study

Credit Hour: 4

Prerequisite: None

Synopsis

After the students have analysed the main problem, they independently design and determine the specifications and requirements of the product. The documents are presented in form of a role play in which the participants act as another character, e.g. manager or customer, to discuss and improve the relevant documents. This mid-term presentations emulate industrial project team meetings with a fixed agenda, protocol, leadership, voting procedures, kick-off etc. They are followed by the evaluation phase which includes an assessment of the solution and problem solving as required from engineering and management principles. After the final kick-off meeting of the team session phase, the design and manufacturing process starts. This phase is critically accompanied by more reviews and laboratory presentations. At the end of the semester, the finished product will be presented to the panel.

Course Outcome

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

Create model of dynamic systems

Design dynamic systems with modern

software

Assemble proposed design and manufacturing of product.

Create solutions to solve problems as required by engineering and management principles

BHA4022

Project Management

Credit Hour: 2

Prerequisite: None

Synopsis

This course introduces the project management concepts in order to enhance the skills and managerial abilities and provide a holistic and integrative view of project management. The covered areas for project management are strategic management, organisation structure and culture, project management, cost estimating and budgeting and project plan.

Course Outcome

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

Analyse life cycle of the projects and project management organisational structures.

Evaluate various frameworks and techniques of strategic plans of management and work breakdown structure (WBS) and project scheduling

Construct various methods for estimating project costs and analyse the project risk management.

BHA4902

Preparation For Bachelor Thesis Bachelor Thesis

Credit Hour: 2

Prerequisite:

Synopsis

Preparation for Bachelor thesis prepares students for real professional approach to engineering studies. It will teach students to structure/plan time and the content their final year project as well as approaches / procedure and tools for making scientific work/research. The task description and fundamental information of the bachelor thesis will be designed and structured.

Course Outcome

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

Evaluate project planning, design, construction and management of the project and theory that had been learned to solve the problems.

Evaluate project solution based on project methodology.

BHA4904

Bachelor Thesis

Credit Hour: 4

Prerequisite: Has passed more than 80 Credit hours

Synopsis

This course aims to train students to utilise their engineering knowledge and technical skill to solve an engineering problems. For this reason, the use of projects as a transport for teaching and for integration of subject area is strongly encouraged throughout the programme. Students should be capable of handling the problem independently with scientific and methodical in a given time.

Course Outcome

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

Devise solution to solve through project planning, design, construction and management.

Develop project solution based on project methodology.

Evaluate practical solution for problems in project through data collection, data analysis and discussion

Analyse research findings into a technical report.

BHA4931

Final Examination

Credit Hour: 1

Prerequisite: None

Synopsis

This course will test the mastery of the basic principles and important facts in learning content of the automotive studies and the bachelor thesis via written viva session between UMP/Company supervisor as well as HsKA supervisor.

Course Outcome

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

Apply related content of the lectures and bachelor thesis to show profound technical knowledge

Explains and practice communication on technical subjects

SPECIALISATION 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.



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