

Faculty of Manufacturing Engineering

FACULTY OF MANUFACTURING ENGINEERING

INTRODUCTION

Faculty of Manufacturing Engineering started initially as a department under Faculty of Manufacturing Engineering & Technology Management in May 2008, recognized as Department of Manufacturing Engineering which was located at Universiti Malaysia Pahang, Gambang Campus. Another department under this faculty was Department of Technology Management. At the beginning, there were only five academic staffs that were seconded from Faculty of Mechanical Engineering. In September 2011, the two departments were separated and Department of Manufacturing Engineering was established as a Faculty of Manufacturing Engineering with the target to produce competent professionals for the manufacturing industry. Being an industry-driven faculty, the faculty offers several academic programs which are significant in preparing students with essential engineers attributes such as solid scientific foundation, psychomotor skills, critical thinking skills, communication skills, and entrepreneurship.

VISION & MISSION

Vision

"To become a world class competency-based manufacturing faculty".

Mission

"Highly committed to UMP core values, we strive to produce competent engineering graduates by providing excellent manufacturing engineering programmes, we also committed to enhance wealth creation through research & development, commercialization, collaboration and consultation in the area of engineering design, process, automation and system".

PROGRAMMES OFFERED

- Bachelor of Manufacturing Engineering
- Bachelor of Mechatronics Engineering
- Bachelor of Mechatronics Engineering (UMP – HsKA, Germany)

LABORATORY FACILITIES

Teaching and research laboratory facilities of the Faculty of Manufacturing Engineering are designed to meet current teaching & learning, research and industrial requirements. It is also designed to meet current safety guidelines and standards. Laboratories at the faculty comprises of all disciplines in manufacturing engineering. These laboratories are as follows:

- Milling Lab
- Turning Lab
- Technical Drawing Lab
- CAD/CAM/CAE Lab
- Programing Lab

- Manufacturing Lab
- Control System Lab
- Mechanic Lab
- Basic Electrical Lab
- Materials Lab
- Thermo Fluid Engineering Lab
- Advanced Machining Lab
- Moulding Lab
- Metal Stamping Lab

FACULTY MANAGEMENT

DEAN

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PROGRAMME CURRICULUM BACHELOR OF MECHATRONICS ENGINEERING					
YEAR	FIRST		THIRD		FOURTH
	FIRST & SECOND	SECOND	FIRST & SECOND	FIRST & SECOND	
SEMESTER	BFF1801 MACHINING 1	BFF1612 CAD MODELLING	BFF3202 SENSORS AND INSTRUMENTATION SYSTEMS	INDUSTRIAL TRAINING (L1) 12 WEEKS	BFF4103 CONTROL SYSTEM ENGINEERING
	BFF1113 ENGINEERING MATERIALS	BFF1123 DYNAMICS	BFF3103 VIBRATIONS		BFM4902 FINAL YEAR PROJECT 1
	BFF1811 MACHINING 2	BFF2801 ELECTRICAL/ELECTRONICS LAB	BFF2823 CAD/CAM/CAE		BFM3**3A MECHATRONICS ELECTIVE 1
	BFF2003 COMPUTER PROGRAMMING	BFF1133 MECHANICS OF MATERIALS	BFF3203 HEAT TRANSFER		BFF3123 MACHINE DESIGN
	BFF1102 STATICS	BFF2403 MANUFACTURING PROCESSES 1	BFF3801 THERMAL FLUID ENGINEERING LAB		BFM4703 COMPUTER-CONTROLLED OF MANUFACTURING SYSTEM
	BFF1602 TECHNICAL DRAWING	BFF1921 ENGINEERS IN SOCIETY	BFF2821 MECHANICS LAB		BFM4914 FINAL YEAR PROJECT 2
	BFF1502 PROJECT MANAGEMENT	BFF2233 THERMODYNAMICS	BFM2013 PROGRAMMING FOR ENGINEERS		BFM4**3C MECHATRONICS ELECTIVE 2
	BFF1303/ ELECTRICAL/ ELECTRONICS ENGINEERING	BFF2223 FLUID MECHANICS	BFF1922 ENGINEERING ECONOMY		BFM4**3D MECHATRONICS ELECTIVE 3
		BFM2303 ANALOG ELECTRONICS	BFM3503 PLC AND MICRO CONTROLLER SYSTEMS		BFM4911 ENVIRONMENT SAFETY & HEALTH
		BFM2313 DIGITAL ELECTRONICS	BFM3403 FLUID DRIVE SYSTEM		
			BFM3303 ELECTRICAL DRIVE SYSTEM		
	100	17	26		27
29	University Required Courses - Applied Calculus, Numerical Method, Ordinary Differential Equations, Technical English, Technical Writing, Academic Report Writing, Islamic And Asian Civilisations 1, Ethnic Relations, Foreign Languages Level 1, Foreign Languages Level 2, Soft Skills 1, Soft Skills 1, Co-Curriculum I, Co-Curriculum II, Technopreneurship, Elective Social Science.				
129	Total Unit For Graduation				
# Elective Subjects - Power Electronics, Electrical Power and Machines, Artificial Intelligence System, Robotics for Engineers.					

PROGRAMME CURRICULUM BACHELOR OF MECHATRONICS ENGINEERING (UMP-HsKA)					
YEAR	FIRST	SECOND	THIRD	FOURTH	FOURTH/FIFTH
SEMESTER	FIRST & SECOND	FIRST & SECOND	FIRST & SECOND	INDUSTRIAL TRAINING (LI) 6 MONTHS	FIRST & SECOND
	BHM1801 MACHINING 1	BHM2603 CAD/CAM	BHM2213 THERMAL - FLUID ENGINEERING 2		BHM4902 TEAM ORIENTED PROJECT STUDY
	BHM1113 ENGINEERING MATERIALS	BHM2103 DYNAMICS	BHM3002 COMPUTER SIMULATION		BHM4102 FINITE ELEMENT ANALYSIS
	BHM1612 CAD MODELING	BHM2003 COMPUTER PROGRAMMING	BHM3103 VIBRATIONS		BHM4702 INDUSTRIAL AUTOMATION
	BHM1123 MECHANICS OF MATERIALS	BHM2403 MANUFACTURING PROCESSES 1	BHM3303 SENSOR AND INSTRUMENTATION SYSTEMS		BHM3712 HYBRID INTEGRATION
	BHM1103 STATICS	BHM2203 THERMO-FLUID ENGINEERING 1	BHM3313 MICROCOMPUTER TECHNOLOGY		BHM3512 MANUFACTURING QUALITY
	BHM1602 TECHNICAL DRAWING	BHM2303 ANALOG ELECTRONICS	BHM4923 ENGINEERING ECONOMY		BHM4906 BACHELOR THESIS
	BHM1303 ELECTRICAL/ ELECTRONICS ENGINEERING	BHM2313 DIGITAL ELECTRONICS	BHM4103 CONTROL SYSTEM ENGINEERING		BHM4932 FINAL EXAMINATION
	BHM1811 MACHINING 2	BHM2013 PROGRAMMING FOR ENGINEERS	BHM3922 INTERSHIP PREPARATION		BHM3722 SMD-TECHNOLOGY
			BHM3612 OPTOELECTRONICS		BHM3702 CLEAN ROOM TECHNOLOGY
			BHM3732 PLC SYSTEM		BHM4402 ELECTRONICS IN MECHATRONICS SYSTEM
			BHM4611 ENVIRONMENT SAFETY AND HEALTH		BHM4002 INFORMATION SYSTEM
		BHM3602 QUALITY INSPECTION			
		BHM3323 SOFTWARE ENGINEERING			
		BHM4921 ENGINEERS AND SOCIETY			
115	18	24	33	14	26
24	University Required Courses : Applied Calculus, Ordinary Differential Equations, Islamic And Asian Civilisations 1, Ethnic Relations, Deutsch Sprache 1, Deutsch Sprache 2, Deutsch Sprache 3, Deutsch Sprache 4, Soft Skills 1, Soft Skill 2, Co-Curriculum I, Co-Curriculum II, Technopreneurship,				
139	Total Unit For Graduation				

SYLLABUS**DEGREE LEVEL****MANUFACTURING PROGRAMME****BFF1102****STATICS****Credit : 2 credits****Pre-requisite : None****Synopsis**

This course introduces force vector algebra, equilibrium of forces on particle, equilibrium of forces on single rigid body and force analysis on simple frames and machine structures (multi-rigid bodies) and problems involving dry friction.

Course Outcomes

- CO 1 Solve equilibrium of forces on particle problems
- CO 2 Solve equilibrium of forces on single rigid body problems
- CO 3 Solve equilibrium of forces on structure problems.
- CO 4 Solve problems on centroid and moment of inertia.

BFF1502**PROJECT MANAGEMENT****Credit : 3 credits****Pre-requisite : None****Synopsis**

This course embraces a broad basic overview and principles of project management which has become central to operations in manufacturing enterprises throughout the three primary processes of managing projects; initialization, planning and scheduling, and organizing.

Course Outcomes

- CO 1 Discover project management concept
- CO 2 Analyze project initialization phase
- CO 3 Analyze project planning and scheduling phase
- CO 4 Analyze project organizing phase

BFF1113**ENGINEERING MATERIALS****Credit : 3 credits****Pre-requisite : None****Synopsis**

This course introduces the structure of metals and plastic deformation, the mechanical and physical properties of materials, the structure and strengthening of metal alloys by heat treatment and the structures and properties of polymeric materials, ceramics and composite materials.

Course Outcomes

- CO 1 Analyze the structure of metals and plastic deformation.
- CO 2 Analyze the mechanical and physical properties of materials.
- CO 3 Analyze the structure and strengthening of metal alloys by heat treatment.
- CO 4 Analyze the structures and properties of polymeric materials, ceramics and composite materials.

**BFF1303
ELECTRICAL AND ELECTRONIC
ENGINEERING****Credit : 3 credits**
Pre-requisite : 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 Outcomes

- CO 1 Solve DC resistive network analysis.
- CO 2 Solve AC network analysis.
- CO 3 Solve circuits involving diodes and bipolar junction transistor (BJT).
- CO 4 Solve circuit involving operational amplifier.
- CO 5 Solve logic circuits problem.

**BFF1123
DYNAMICS****Credit : 3 credits**
Pre-requisite : Statics BFF1102**Synopsis**

This course introduces principles of kinematics of a particle and a rigid body, kinetics of a particle and a rigid body utilizing force and acceleration method, work and energy method and impulse and momentum method.

Course Outcomes

- CO 1 Solve problems involving kinematics of a particle and planar kinematics of a rigid body.
- CO 2 Solve problems involving kinetics of a particle and planar kinetics of a rigid

body utilizing force and acceleration method.

- CO 3 Solve problems involving kinetics of a particle and planar kinetics of a rigid body utilizing work and energy method.
- CO 4 Solve problems involving kinetics of a particle and planar kinetics of a rigid body utilizing impulse and momentum method.

**BFF1602
TECHNICAL DRAWING****Credit : 2 credits**
Pre-requisite : None**Synopsis**

This course introduces basic technical drawing method, symbols and standards. Manual drafting and CAD software are used to produce drawing on assignments throughout the course.

Course Outcomes

- CO 1 Apply the standard needs to be followed when producing the drawing.
- CO 2 Produce the orthographic drawing including sectioning.
- CO 3 Apply the correct symbol and representations in the drawing.
- CO 4 Produce the assembly and detailed drawing.

**BFF1612
CAD MODELING**

Credit : 2 credits
Pre-requisite : Technical Drawing
BFF1602

Synopsis

This course introduces 3D surface solid modeling which emphasized on the drawing, functioning and organizing the model. Further course content included part assembly, animation and basic FEA application. Students experience the practical learning through the CAD software.

Course Outcomes

- CO 1 Apply modeling principle in product design
- CO 2 Produce 3D part models and standard technical drawing
- CO 3 Produce assembly models and drawing
- CO 4 Perform basic FEA simulation and animation.

**BFF1801
MACHINING 1**

Credit : 1 credit
Pre-requisite : None

Synopsis

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

Course Outcomes

- CO 1 Perform basic manual production techniques

- CO 2 Perform basic turning processes and operations according to the given dimensions, specifications and tolerances.

**BFF1811
MACHINING 2**

Credit : 1 credit
Pre-requisite : None

Synopsis

This course introduces student basic application of the measuring instruments, milling process and surface grinding.

Course Outcomes

- CO 1 Perform various basic milling operations safely.
- CO 2 Perform surface grinding process according to the given dimensions, specifications and tolerances.

**BFF2003
COMPUTER PROGRAMMING**

Credit : 3 credits
Pre-requisite : None

Synopsis

This course introduces input and output, variables, constants, arithmetic operations and mathematical functions, user-defined functions, selection making decision and repetitive construct, and array data structure. The programming language used for the course is C language.

Course Outcomes

- CO 1 Write C program for input and output.
- CO 2 Write C program using variables, constants declarations, arithmetic operations and mathematics function.

- CO 3 Write C program using user-defined functions.
- CO 4 Write C program using selection making decision construct.
- CO 5 Write C program using repetitive construct.
- CO 6 Write C program using array data structure.

BFF2403 MANUFACTURING PROCESSES 1

Credit : 3 credits
Pre-requisite : Engineering Material BFF1113

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 Outcomes

- CO 1 Analyze metal-casting processes
- CO 2 Analyze forming processes
- CO 3 Analyze joining processes
- CO 4 Analyze material removal processes
- CO 5 Analyze surface technology processes

BFF2413 MANUFACTURING PROCESSES 2

Credit : 3 credits
Pre-requisite : Engineering Material BFF1113

Synopsis

This course introduces the processing of ceramics and composites materials. It also covers powder metallurgy, non-traditional machining and rapid prototyping processes.

Course Outcomes

- CO 1 Analyze the processing of composites materials
- CO 2 Analyze the processing of ceramic materials
- CO3 Analyze the powder metallurgy processes
- CO 4 Analyze the non-traditional machining processes
- CO 5 Analyze the rapid prototyping process

BFF2503 QUALITY AND RELIABILITY ENGINEERING

Credit : 3 credits
Pre-requisite : None

Synopsis

This course introduces the concept of basic quality tools, fundamental of statistics, control charts for variables, fundamental of probability, control charts for attributes, acceptance sampling systems and reliability.

Course Outcomes

- CO 1 Solve the quality improvement by using the basic Statistical Process Control (SPC) tools
- CO 2 Analyze the collection of quantitative data pertaining to any subject or group when the data systematically gathered and collated
- CO 3 Solve the quality improvement by using control chart attributes and variables.

CO 4 Analyze the various sampling systems in terms of lot by lot, continuous production attributes and variables.

CO 5 Compute the reliability of systems including systems in series, parallel, and hybrid combinations.

**BFF2623
CAD/CAM /CAE**

Credit : 3 credits
Pre-requisite : CAD Modelling BFF1612

Synopsis

This course was introduces to develop students a degree of competencies in the CAD / CAM/CAE principle, application and integration that applied in the modern manufacturing system. Through the selected computer assisted simulation software interface (CATIA), emphasizes will be given on the application of various prismatic (2-axis) and surface (3-axis) machining strategies plus the manual programming fundamentals and finally to produce the final NC code for the manufacturing of various complex mechanical parts.

Course Outcomes

CO 1 Understand the principal ,application and integration of CADCAMCAE system in the manufacturing

CO 2 Understand the fundamentals of manual part programming

CO 3 Produce part programming for complex three-dimensional motion using CAM software

CO 4 Perform actual 2 & 3 axis machining for various mechanical parts at the CNC machine

**BFF2633
MANUFACTURING PROCESS DESIGN**

Credit : 3 credits
Pre-requisite : None

Synopsis

This course introduces the process of product design and development. It started with identifying customer needs, product specifications, generate selection and testing concept until the finished product.

Course Outcomes

CO 1 Conduct initial activities of product development.

CO 2 Perform development of product concept phase.

CO 3 Implement Concurrent Product and Process Design (CPPD).

CO 4 Analyze the product development process

CO 5 Manage product development project.

**BFF2801
ELECTRICAL / ELETRONICS LAB**

Credit : 1 credit
Pre-requisite : Electrical & Electronics Engineering BFF1303

Synopsis

This course introduces practical electrical and electronics circuits. Students shall design, analyze and build electrical power, digital electronic and electromechanical systems.

Course Outcomes

CO 1 Familiar with soft instruments and Multi SIM.

- CO 2 Design, analyze and build electrical power system.
- CO 4 Design, analyze and build digital electronic system.
- CO 5 Design, analyze and build electro-mechanical system.

BFF2821 MECHANICS LAB

Credit : 1 credit
Pre-requisite : Mechanics of Material BFF1133, Dynamics BFF1123

Synopsis

This lab introduces engineering materials principles, principles of solid mechanics through practical experiments. It covers most areas of material properties testings. The covered areas for principles of statics are force resolutions, moments and trusses. It also covers experiments on stress and strain in axial & compression loading, torsion, fatigue, bending moment, shearing stress and transformations of stress and strain. Finally, this lab also covers applications on kinematics of particles, force and acceleration, work and energy, and impulse and momentum.

Course Outcomes

- CO 1 Identify the microstructure of plain carbon steel at various carbon compositions and different heat treatment
- CO 2 Determine the hardness values and strengths for different materials
- CO 3 Determine impact properties and toughness characteristic of metal materials using the impact test.
- CO 4 Determine the distribution of forces in a central system, a point force of the section principle on the bending bar

and the member of forces at varying angles in simple frameworks.

- CO 5 Determine effects of bending moment, torsion, pure tension and compression.

BFF2223 FLUID MECHANICS

Credit : 3 credits
Pre-requisite : None

Synopsis

This course introduces properties of fluid, concept of pressure and its application, stability of floating bodies, fluid in motion analysis, fluid momentum analysis, flow measurement devices, fluid friction in piping system and dimensional analysis.

Course Outcomes

BFF2233 THERMODYNAMICS

Credit : 3 credits
Pre-requisite : None

Synopsis

This course focuses on the application of the 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.

Course Outcome

- CO1: Solve fluid statics based problems.
- CO2: Solve fluid in motion problems.
- CO3: Solve fluid friction in pipes problems.
- CO4: Solve fluid flow measurement problems.

CO5: Apply the concept of dimensional analysis

BFF3203

HEAT TRANSFER

Credit : 3 credits

Pre-requisite : BFF2233

Thermodynamics

Synopsis

This course introduces the mechanism of heat transfer through conduction, convection and radiation. The course provides an overview of basic principles of heat transfer and their application to engineering problems. This overview includes an introduction to steady and unsteady conduction, numerical methods, free and forced convection, radiation and heat exchanger design.

Course Outcomes

- CO1: Distinguish heat transfer mechanism of conduction, convection and radiation
- CO2: Solve problems in one-dimensional heat conduction
- CO3: Solve problems in multidimensional and transient heat conduction
- CO4: Solve problems in convection
- CO5: Solve problems in radiation
- CO6: Solve problems in heat transfer through heat exchanger

BFF1133

MECHANICS OF MATERIAL

Credit : 3 credits

Pre-requisite : BFF1102 Statics;

BFF1113 Engineering Materials

Synopsis

This course introduces the concept of stress and strain under axial, torsion, bending, transverse shear and combined loadings in elastic structural members. Plane stress transformation is also included.

Course Outcomes

- CO 1: Solve the stress and strain in structural members subjected to axial loads.
- CO 2: Solve the stress and strain in structural members subjected to torsional loads.
- CO 3: Solve the stress and strain in structural members subjected to bending loads.
- CO 4: Solve the stress and strain in structural members subjected to shear loads.
- CO 5: Solve the stress and strain in structural members subjected combined loads.
- CO 6: Conduct the stress transformation.

BFF3103

VIBRATIONS

Credit : 3 credits

Pre-requisite : Dynamics BFF1123

Synopsis

This course introduces the fundamental of vibration, free vibration (Single Degree of Freedom - SDOF System), harmonically excited vibration (SDOF System), general excited vibration (SDOF System), two degree of freedom (TDOF System), and vibration control.

Course Outcomes

- CO 1 Analyze the single degree of freedom system vibration
- CO 2 Analyze the harmonically excited vibration of single degree of freedom system.
- CO 3 Analyze the two degree of freedom system vibration.
- CO 4 Analyze the vibration control problems.

BFF3123

MACHINE DESIGN

Credit : 3 credits

Pre-requisite : Mechanics of Material BFF1133, Dynamics BFF1123

Synopsis

This course focuses on the fundamentals of component design—free body diagrams, force flow concepts, failure theories, and fatigue design, with applications to fasteners, springs, bearings, gears, shafts, clutches, and brakes. It explains the basics of mechanics, strength of materials, and materials properties on how to apply these fundamentals to specific machine components design

Course Outcomes

- CO 1 Analyze the concept of machine design
- CO 2 Solve problems on various loadings and stresses
- CO 3 Analyze the failures of machine components
- CO 4 Design various parts in machine components

BFF3202

SENSOR AND INSTRUMENTATIONS

Credit : 2 credits

Pre-requisite : Electrical & Electronics Lab BFF2801

Synopsis

This course covers PC-based data acquisition system to measure speed, position, temperature, strain, force and pressure. Extensive laboratory and group project.

Course Outcomes

- CO 1 Conduct PC-based data acquisition
- CO 2 Design and build instrumentation amplifier circuit.
- CO 3 Design and build instrumentation filter circuit.
- CO 4 Interface with sensors.

BFF1922

ENGINEERING ECONOMY

Credit : 2 credits

Pre-requisite : None

Synopsis

This course introduces concept of life cycle cost, interest and equivalent. Formula and factors for single and multiple cash flow. Method for investment assessment and alternative comparison and project evaluation using cost worth ratio, inflation and cash flow method.

Course Outcomes

- CO1: Analyze the engineering cost concept.
 CO2: Analyze the return to capital
 CO2: Analyze the money-time relationship
 CO4: Analyze the depreciation of the asset
 CO5: Analyze the cost estimation and project evaluation

BFF3503**PRODUCTION ENGINEERING****Credit : 3 credits****Pre-requisite : None****Synopsis**

This course introduces the role of production engineering in a manufacturing plant. The concept of production engineering for lean production, planning of a manufacturing plant from layout planning, process planning, equipment and facilities planning up to planning a manual line and automated line will be introduced together with practical project. Student too will expose to the basic knowledge of work measurement, takt time and human elements planning in performing production engineering tasks.

Course Outcomes

- CO 1 Illustrate the role of production engineering in selecting appropriate production system and implement steps for capital equipment planning and factory specification for a manufacturing plant.
- CO 2 Specify the process requirement for an efficient manufacturing set up which include process flow, process layout and process planning incorporating man & machine relationship and material flow
- CO 3 Perform a work cell study to determine the human elements in a particular work cell, and conduct

measurement for process cycle time, takt

time and line balancing for every processes in the production line.

- CO 4 Compute a work cell design for a lean process and plan the facilities for both manual assembly line operation and automated assembly operation.

BFF3513**MANUFACTURING SYSTEM****Credit : 3 credits****Pre-requisite : None****Synopsis**

The course provides in-depth understanding of the structure and function of modern manufacturing systems. Methods of managing resources in manufacturing systems to achieve the strategic goals of improved quality, increased flexibility, reduced product cycle time and greater efficiency will be emphasized.

Course Outcomes

- CO 1 Classify the manufacturing environment including Jobbing Shop Production, Batch Production and Mass Production.
- CO 2 Analyze the requirement planning (MRP and MRP II).
- CO 3 Investigate the Just In Time (JIT) approach and Kanban system.
- CO 4 Analyze operation of Optimized Production Technology (OPT).
- CO 5 Develop the best system which draws the best of JIT, MRP and OPT to use for specific manufacturing environment.

BFF3523 PRODUCTION PLANNING AND CONTROL

Credit : 3 credits

Pre-requisite : None

Synopsis

The topics covered in the course are production and operations strategy, forecasting techniques, deterministic inventory planning and control, stochastic inventory planning and control, aggregate production planning, and master production scheduling.

Course Outcomes

- CO 1 Analyze the fundamental problem areas of production systems as well as the relationship between production planning and control activities.
- CO 2 Justify different strategies employed in manufacturing and service industries to plan production and control inventory.
- CO 3 Analyze the planning problems and use the appropriate analytical skills and tools to solve these problems.

BFF3801 THERMAL-FLUID ENGINEERING LAB

Credit : 1 credit

**Pre-requisite : Thermodynamics
BFF2233, Fluid Mechanics BFF2223**

Synopsis

This lab introduces practical application of basic thermofluid principles and the covered areas are the practical applications of pure substance, first law and second law of thermodynamics, refrigeration cycle, conduction heat transfer Bernoulli's theorem, flow trajectories over rigid body, friction losses in pipes, flow measurements, fluid pressure and boundary layer.

Course Outcomes

- CO 1 To recognize basic concept of thermodynamic and properties of pure substances.
- CO 2 To apply the first law of thermodynamics and able to solve energy balance and transfer problem, open-close system analysis.
- CO 3 To apply the second law of thermodynamic and able to employ the ideal principle Of Carnot heat engines, refrigerators and heat pumps in practical application.
- CO 4 To investigate and evaluate operating characteristics and performance of gas power cycles, vapor cycles, combined gas-vapor power cycles.
- CO 5 To solve basic heat transfer analysis of conduction in various medium.
- CO 6 Determine the buoyancy, stability and center of fluid pressure.
- CO 7 Apply Bernoulli's theorem.
- CO 8 Apply the concept of friction losses in pipes.
- CO 9 Determine volumetric fluid flow using orifice and venturi.
- CO 10 Apply the concept of static fluid pressure.

**BFF1921
ENGINEERS IN SOCIETY**

Credit : 1 credit
Pre-requisite : 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 Outcomes

- CO 1 Determine the engineering profession and code of ethics
- CO 2 Analyze the issues in local industries
- CO 3 Analyze the working ethics and public responsibility
- CO 4 Analyze the law which governing the engineering profession

**BFF3906
INDUSTRIAL TRAINING**

Credit : 6 credits
Pre-requisite : Third year student and achieved "Kedudukan Baik (KB)" status on current evaluation

Synopsis

The industrial training has to be completed in an industrial firm. The students work in current projects of the firm in the development, production or distribution process. The projects deal with manufacturing or related fields and allow the practical application of university knowledge. The training delivers insight into the future professional life.

Course Outcomes

- CO 1 Comprehend how to use their acquired knowledge in practice
- CO 2 Comprehend the operational processes in a firm.

**BFF4103
CONTROL SYSTEM ENGINEERING**

Credit : 3 credits
Pre-requisite : Vibrations BFF3103

Synopsis

This course introduces linear, time-invariant (LTI) control system modeling, analysis and design. The covered topics are state space modeling of dynamic systems; transient, stability and steady-state analysis; control system analysis and design using root-locus and frequency response techniques.

Course Outcomes

- CO 1 Analyze and design control system compensators to achieve specified control system performances utilizing state-space technique.
- CO 2 Analyze and design control system compensators to achieve specified control system performances utilizing frequency-response technique.
- CO 3 Analyze and design control system compensators to achieve specified control system performances utilizing root-locus technique.
- CO 4 Analyze system performances.

**BFF3403
ADVANCED MACHINING (Electives)**

Credit : 3 credits
Pre-requisite : None

Synopsis

This course will introduce the knowledge and technologies in precision machining, technique of making tool and die and engineering measurement using industrial standard equipments

Course Outcomes

- CO 1 Analyze precision machining processes
- CO 2 Analyze tool & die and mould making processes
- CO 3 Analyze engineering measurement processes
- CO 4 Analyze advance machining processes in mould and die making

BFF3603**PLASTIC PRODUCT DESIGN (Electives)****Credit : 3 credits****Pre-requisite : CAD/CAM/CAE BFF2623****Synopsis**

This course will introduce the knowledge and technology of plastic development.

Course Outcomes

- CO 1 Analyze the plastic characteristic
- CO 2 Identify the plastic parts
- CO 3 Design a plastic product
- CO 4 Analyze the product

BFF3613**SHEET METAL PRODUCT DESIGN (Electives)****Credit : 3 credits****Pre-requisite : CAD/CAM/CAE BFF2623****Synopsis**

This course will introduce the knowledge and technology of sheet metal product design.

Course Outcomes

- CO 1 Analyzing the sheet metal characteristic

- CO 2 Identify types of sheet metal operation.
- CO 3 Design the sheet metal product
- CO 4 Analyze the product

FACTORY MANAGEMENT (Electives)**Credit : 3 credits****Pre-requisite : None****Synopsis**

This course introduces student to understand & integrate all the knowledge essential to produce good quality products; at competitive prices & deliver on-time to meet customers' satisfaction.

Course Outcomes

- CO 1 Identify the functional and organisational groups and its integration in a plant
- CO 2 Identify the elements of Quality Management Systems in a manufacturing plant
- CO 3 Identify types production schedules with material and factory constraints.
- CO 4 Solve manufacturing related problems with modern tools

BFF4513**LEAN PRODUCTION SYSTEM (Electives)****Credit : 3 credits****Pre-requisite : Factory Management BFF4503****Synopsis**

This course introduces the role of lean production system in a manufacturing environment. The concept of waste elimination through implementing lean production system. Using the basic principle of Pull system to promote waste elimination, various Lean tools

would be introduced which include value stream mapping, 5S system, SMED and Total Productive Maintenance.

Course Outcomes

- CO 1 Specify the wasteful activities and elements in the manufacturing plant and causes of these non value added activities.
- CO 2 Perform a value stream mapping (VSM) study for a manufacturing process from the incoming material until product delivery and illustrate the non-value added activities and methods to improve them.
- CO 3 Plan a work place improvement using 5S system and changeover improvement for downtime reduction using single minute exchange of die (SMED) activities
- CO 4 Compute methods to improve machine availability, performance & product quality measured by Overall Equipment Effectiveness (OEE) using Total preventive Maintenance initiatives.

TOTAL QUALITY MANAGEMENT (Electives)

Credit : 3 credits

Pre-requisite : None

Synopsis

This course introduces the principle, philosophies and techniques of Total Quality Management (TQM) applied in the manufacturing environment. TQM tools and techniques such as the Quality Function Deployment (QFD), Failure Mode Effect Analysis (FMEA), Taguchi Quality Loss Function and Statistical Process Control will be emphasized plus the definition of Quality Management System such as ISO 9000 and Six Sigma.

Course Outcomes

- CO1 To develop an understanding of Total Quality and how to manage quality with statistical tools.
- CO2 To gain insight on TQM philosophies, strategies and important quality concepts such as customer focus, team working, employee empowerment and continuous improvement
- CO3 To understand Statistical Process Control and related techniques, interpret control-charts and recognize their importance in TQM.

BFF4613

DIE 1(Electives)

Credit : 3 credits

Pre-requisite : Sheet metal Product Design BFF3613, Advance Machining BFF3403

Synopsis

This course enhances student's theoretical knowledge and practical skill in tool & dies making that can be applied in manufacturing. Students are exposed to analyze various existing and new different metal stamping processes, the concepts and suitable application area of these dies. Technical aspects in progressive die design and fabrication are taught particularly the theories of cutting in sheet metal, cutting clearance, flat blank development, strip layout design and force calculations. The assembly, stamping trial and troubleshooting of the progressive die will also be emphasized.

Course Outcomes

- CO1 Analyze various existing and new metal stamping process
- CO2 Design and analyze strip layout of progressive die

- CO3 Design and fabricate components of a progressive die
- CO4 Assembly, stamping trial and troubleshooting of the progressive die

BFF4633**DIE 2(Electives)****Credit : 3 credits****Pre-requisite : Die 1 BFF4613, Advance Machining BFF3403****Synopsis**

This course is particularly designed to introduce the drawing operation in the press tool technology. The design and analysis of the drawing product and the operation itself will be emphasized. Students should be capable to perform the various drawing die design such including the fabrication of the die. At the end of this module, students should be able to assemble the drawing die, conduct actual trial and analyse the final product together with the troubleshooting.

Course Outcomes

- CO 1 Design and analyze the drawing product design and the drawing operation
- CO 2 Analyze the mechanics of sheet metal forming related to drawing operation and design the drawing die
- CO 3 Fabricate the components of drawing die
- CO 4 Fabricate the drawing die, assembly the die, conduct trial, analyse the final product and perform the troubleshooting.

BFF4603**MOLD 1(Electives)****Credit : 3 credits****Pre-requisite : Plastic Product Design BFF3603, Advance Machining BFF3403****Synopsis**

This course will introduce the knowledge and technologies in designing a mould for plastic products which have undercuts.**Course**

Outcomes

- CO1 Define mould design
- CO2 Analyze the mould design for external undercuts
- CO 3 Analyze the mould design for internal undercuts
- CO4 Design a mould for undercuts

BFF4623**MOLD 2(Electives)****Credit : 3 credits****Pre-requisite : Mold 1 BFF4603, Advance Machining BFF3403****Synopsis**

This course will introduce the knowledge and technologies in designing a multi daylight plastic injection mould.

Course Outcomes

- CO1 Define the multi daylight mould design
- CO2 Analyze the mould design for multi daylight mould
- CO3 Analyze the runnerless mould design
- CO4 Design a multi daylight injection mould

BFF4513**LEAN PRODUCTION SYSTEM 2(Electives)****Credit : 3 credits****Pre-requisite : Factory Management****BFF4503****Synopsis**

This course introduces the role of lean production system in enhancing product built-in-quality in a manufacturing environment. The built in quality (Jidoka) concept covers principles defect prevention (fool proofing), automation and human intervention (autonomation) and employees small group activities (SGA) as advocate by lean production principles to achieve 6 sigma product quality.

Course Outcomes

- CO1: Apply the principles of Jidoka in a manufacturing plant to promote quality autonomy to the employees, and identify necessary infrastructure required for application of this principles.
- CO2: Application of visual management system and andon system to achieve total plant control through visual control.
- CO3 Conduct process defect prevention and detection through implementing poka-yoke (fool-proofing) system to the production processes.
- CO4: Participate and propose small autonomous group activities to conduct various quality and productivity improvement activities by using the standard problem analysis and solving tools.
- CO5: Participate in Total Productive Maintenance activities and conduct autonomous maintenance activities to improve machine availability, performance & product quality measured by Overall Equipment

Effectiveness (OEE)

BFF4902**FINAL YEAR PROJECT 1****Credit : 2 creditS****Pre-requisite : Please refer to PSM handbook (Has passed more than 80 Credit hours)****Synopsis**

This course focuses on the real professional approach to engineering studies. Students will practice their engineering knowledge and technical skill from the previous training to solve an engineering problem. The application of project management element as a medium for conducting and integration all expertise areas during the course run is highly encouraged.

Course Outcomes

- CO 1 Relate the proposed area to the learned courses
- CO 2 Establish techniques for literature review and independently perform the ability to gather information.
- CO 3 Define problem statement, objectives , scope , research methods with identification of appropriate tools
- CO 4 Plan the project using project management tools i.e Gantt Chart
- CO 5 Communicate well on the work progress, presentation and in the final report

BFF4914**FINAL YEAR PROJECT 2****Credit : 4 credits****Pre-requisite : Please refer to PSM handbook (Has passed more than 80 Credit hours)****Synopsis**

This course focuses on the real professional approach to engineering studies. Students will practice their engineering knowledge and technical skill from the previous training to solve an engineering. The application of project management element as a medium for conducting and integration all expertise areas during the course run is highly encouraged.

Course Outcomes

- CO 1 Design the experiment or questionnaire to start collecting data
- CO 2 Set-up and conduct the planned experiment or questionnaire
- CO 3 Interpret and analyse collected data
- CO 4 Plan the project using project management tools i.e Gantt Chart
- CO 5 Communicate well on the work progress, presentation and in the final report

MECHATRONICS PROGRAMME**BFF1102****STATICS****Credit : 2 credits****Pre-requisite : None****Synopsis**

This course introduces force vector algebra, equilibrium of forces on particle, equilibrium of forces on single rigid body and force analysis on simple frames and machine structures

(multi-rigid bodies) and problems involving dry friction.

Course Outcomes

- CO 1 Solve equilibrium of forces on particle problems
- CO 2 Solve equilibrium of forces on single rigid body problems
- CO 3 Solve equilibrium of forces on structure problems.
- CO 4 Solve problems on centroid and moment of inertia.

BFF1502**PROJECT MANAGEMENT****Credit : 3 credits****Pre-requisite : None****Synopsis**

This course embraces a broad basic overview and principles of project management which has become central to operations in manufacturing enterprises throughout the three primary processes of managing projects; initialization, planning and scheduling, and organizing.

Course Outcomes

- CO 1 Discover project management concept
- CO 2 Analyze project initialization phase
- CO 3 Analyze project planning and scheduling phase
- CO 4 Analyze project organizing phase

**BFF1113
ENGINEERING MATERIALS****Credit : 3 credits****Pre-requisite : None****Synopsis**

This course introduces the structure of metals and plastic deformation, the mechanical and physical properties of materials, the structure and strengthening of metal alloys by heat treatment and the structures and properties of polymeric materials, ceramics and composite materials.

Course Outcomes

- CO 1 Analyze the structure of metals and plastic deformation.
- CO 2 Analyze the mechanical and physical properties of materials.
- CO 3 Analyze the structure and strengthening of metal alloys by heat treatment.
- CO 4 Analyze the structures and properties of polymeric materials, ceramics and composite materials.

**BFF1303
ELECTRICAL AND ELECTRONIC
ENGINEERING****Credit : 3 credits****Pre-requisite : 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 Outcomes

- CO 1 : Solve DC resistive network analysis.
- CO 2: Solve AC network analysis.
- CO 3: Solve circuits involving diodes and bipolar junction transistor (BJT).
- CO 4: Solve circuit involving operational amplifier.
- CO 5: Solve logic circuits problem.

**BFF1123
DYNAMICS****Credit : 3 credits****Pre-requisite : Statics BFF1102****Synopsis**

This course introduces principles of kinematics of a particle and a rigid body, kinetics of a particle and a rigid body utilizing force and acceleration method, work and energy method and impulse and momentum method.

Course Outcomes

- CO 1 Solve problems involving kinematics of a particle and planar kinematics of a rigid body.
- CO 2 Solve problems involving kinetics of a particle and planar kinetics of a rigid body utilizing force and acceleration method.
- CO 3 Solve problems involving kinetics of a particle and planar kinetics of a rigid body utilizing work and energy method.
- CO 4 Solve problems involving kinetics of a particle and planar kinetics of a rigid body utilizing impulse and momentum method.

**BFF1602
TECHNICAL DRAWING****Credit : 2 credits****Pre-requisite : None****Synopsis**

This course introduces basic technical drawing method, symbols and standards. Manual drafting and CAD software are used to produce drawing on assignments throughout the course.

Course Outcomes

- CO 1 Apply the standard needs to be followed when producing the drawing.
- CO 2 Produce the orthographic drawing including sectioning.
- CO 3 Apply the correct symbol and representations in the drawing.
- CO 4 Produce the assembly and detailed drawing.

**BFF1612
CAD MODELING****Credit : 2 credits****Pre-requisite : Technical Drawing****BFF1602****Synopsis**

This course introduces 3D surface solid modeling which emphasized on the drawing, functioning and organizing the model. Further course content included part assembly, animation and basic FEA application. Students experience the practical learning through the CAD software.

Course Outcomes

- CO 1 Apply modeling principle in product design
- CO 2 Produce 3D part models and standard technical drawing

CO 3 Produce assembly models and drawing

CO 4 Perform basic FEA simulation and animation.

**BFF1801
MACHINING 1****Credit : 1 credit****Pre-requisite : None****Synopsis**

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

Course Outcomes

- CO 1 Perform basic manual production techniques
- CO 2 Perform basic turning processes and operations according to the given dimensions, specifications and tolerances.

**BFF1811
MACHINING 2****Credit : 1 credit****Pre-requisite : None****Synopsis**

This course introduces student basic application of the measuring instruments, milling process and surface grinding.

Course Outcomes

- CO 1 Perform various basic milling operations safely.

CO 2 Perform surface grinding process according to the given dimensions, specifications and tolerances.

**BFF2003
COMPUTER PROGRAMMING**

Credit : 3 credits

Pre-requisite : None

Synopsis

This course introduces input and output, variables, constants, arithmetic operations and mathematical functions, user-defined functions, selection making decision and repetitive construct, and array data structure. The programming language used for the course is C language.

Course Outcomes

- CO 1 Write C program for input and output.
- CO 2 Write C program using variables, constants declarations, arithmetic operations and mathematics function.
- CO 3 Write C program using user-defined functions.
- CO 4 Write C program using selection making decision construct.
- CO 5 Write C program using repetitive construct.
- CO 6 Write C program using array data structure.

**BFF2403
MANUFACTURING PROCESSES 1**

Credit : 3 credits

Pre-requisite : Engineering Material BFF1113

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 Outcomes

- CO 1 Analyze metal-casting processes
- CO 2 Analyze forming processes
- CO 3 Analyze joining processes
- CO 4 Analyze material removal processes
- CO 5 Analyze surface technology processes

**BFF2623
CAD/CAM /CAE**

Credit : 3 credits

Pre-requisite : CAD Modelling BFF1612

Synopsis

This course was introduces to develop students a degree of competencies in the CAD / CAM/CAE principle, application and integration that applied in the modern manufacturing system. Through the selected computer assisted simulation software interface (CATIA), emphasizes will be given on the application of various prismatic (2-axis) and surface (3-axis) machining strategies plus the manual programming fundamentals and finally to produce the final NC code for the manufacturing of various complex mechanical parts.

Course Outcomes

- CO 1 Understand the principal application and integration of CAD/CAM/CAE system in the manufacturing
- CO 2 Understand the fundamentals of manual part programming
- CO 3 Produce part programming for complex three-dimensional motion using CAM software
- CO 4 Perform actual 2 & 3 axis machining for various mechanical parts at the CNC machine

BFF2801**ELECTRICAL / ELECTRONICS LAB****Credit : 1 credit****Pre-requisite : Electrical & Electronics Engineering BFF1303****Synopsis**

This course introduces practical electrical and electronics circuits. Students shall design, analyze and build electrical power, digital electronic and electromechanical systems.

Course Outcomes

- CO 1 Familiar with soft instruments and Multi SIM.
- CO 2 Design, analyze and build electrical power system.
- CO 4 Design, analyze and build digital electronic system.
- CO 5 Design, analyze and build electro-mechanical system.

BFF2821**MECHANICS LAB****Credit : 1 credit****Pre-requisite : Mechanics of Material BFF1133, Dynamics BFF1123****Synopsis**

This lab introduces engineering materials principles, principles of solid mechanics through practical experiments. It covers most areas of material properties testings. The covered areas for principles of statics are force resolutions, moments and trusses. It also covers experiments on stress and strain in axial & compression loading, torsion, fatigue, bending moment, shearing stress and transformations of stress and strain. Finally, this lab also covers applications on kinematics of particles, force and acceleration, work and energy, and impulse and momentum.

Course Outcomes

- CO 1 Identify the microstructure of plain carbon steel at various carbon compositions and different heat treatment
- CO 2 Determine the hardness values and strengths for different materials
- CO 3 Determine impact properties and toughness characteristic of metal materials using the impact test.
- CO 4 Determine the distribution of forces in a central system, a point force of the section principle on the bending bar and the member of forces at varying angles in simple frameworks.
- CO 5 Determine effects of bending moment, torsion, pure tension and compression.

**BFF2223
FLUID MECHANICS****Credit : 3 credits****Pre-requisite : None****Synopsis**

This course introduces properties of fluid, concept of pressure and its application, stability of floating bodies, fluid in motion analysis, fluid momentum analysis, flow measurement devices, fluid friction in piping system and dimensional analysis.

Course Outcomes**BFF2233
THERMODYNAMICS****Credit : 3 credits****Pre-requisite : None****Synopsis**

This course focuses on the application of the 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

CO1 Solve fluid statics based problems

CO2 Solve fluid in motion problems.

CO3 Solve fluid friction in pipes problems

CO4 Solve fluid flow measurement problems.

CO5 Apply the concept of dimensional analysis

**BFF3203
HEAT TRANSFER****Credit : 3 credits****Pre-requisite : BFF2233****Thermodynamics
Synopsis**

This course introduces the mechanism of heat transfer through conduction, convection and radiation. The course provides an overview of basic principles of heat transfer and their application to engineering problems. This overview includes an introduction to steady and unsteady conduction, numerical methods, free and forced convection, radiation and heat exchanger design.

Course Outcomes

CO1: Distinguish heat transfer mechanism of conduction, convection and radiation

CO2: Solve problems in one-dimensional heat conduction

CO3: Solve problems in multidimensional and transient heat conduction

CO4: Solve problems in convection

CO5: Solve problems in radiation

CO6: Solve problems in heat transfer through heat exchanger

**BFF1133
MECHANICS OF MATERIAL****Credit : 3 credits****Pre-requisite : BFF1102 Statics;****BFF1113 Engineering Materials****Synopsis**

This course introduces the concept of stress and strain under axial, torsion, bending, transverse shear and combined loadings in

elastic structural members. Plane stress transformation is also included.

Synopsis

- CO 1: Solve the stress and strain in structural members subjected to axial loads.
- CO 2: Solve the stress and strain in structural members subjected to torsional loads.
- CO 3: Solve the stress and strain in structural members subjected to bending loads.
- CO 4: Solve the stress and strain in structural members subjected to shear loads.
- CO 5: Solve the stress and strain in structural members subjected combined loads.
- CO 6: Conduct the stress transformation.

BFF3103

VIBRATIONS

Credit : 3 credits

Pre-requisite : Dynamics BFF1123

Synopsis

This course introduces the fundamental of vibration, free vibration (Single Degree of Freedom - SDOF System), harmonically excited vibration (SDOF System), general excited vibration (SDOF System), two degree of freedom (TDOF System), and vibration control.

Course Outcomes

- CO 1 Analyze the single degree of freedom system vibration

CO 2 Analyze the harmonically excited vibration of single degree of freedom system.

CO 3 Analyze the two degree of freedom system vibration.

CO 4 Analyze the vibration control problems.

BFF3123

MACHINE DESIGN

Credit : 3 credits

Pre-requisite : Mechanics of Material BFF1133, Dynamics BFF1123

Synopsis

This course focuses on the fundamentals of component design—free body diagrams, force flow concepts, failure theories, and fatigue design, with applications to fasteners, springs, bearings, gears, shafts, clutches, and brakes. It explains the basics of mechanics, strength of materials, and materials properties on how to apply these fundamentals to specific machine components design

Course Outcomes

- CO 1 Analyze the concept of machine design
- CO 2 Solve problems on various loadings and stresses
- CO 3 Analyze the failures of machine components
- CO 4 Design various parts in machine components

BFF3202
SENSOR AND INSTRUMENTATIONS

Credit : 2 credits
Pre-requisite : Electrical & Electronics
 Lab BFF2801

Synopsis

This course covers PC-based data acquisition system to measure speed, position, temperature, strain, force and pressure. Extensive laboratory and group project.

Course Outcomes

- CO 1 Conduct PC-based data acquisition
- CO 2 Design and build instrumentation amplifier circuit.
- CO 3 Design and build instrumentation filter circuit.
- CO 4 Interface with sensors.

BFF1922
ENGINEERING ECONOMY

Credit : 2 credits
Pre-requisite : None

Synopsis

This course introduces concept of life cycle cost, interest and equivalent. Formula and factors for single and multiple cash flow. Method for investment assessment and alternative comparison and project evaluation using cost worth ratio, inflation and cash flow method.

Course Outcomes

- CO 1 Analyze the engineering cost concept
- CO 2 Analyze the return to capital
- CO 3 Analyze the money-time relationship
- CO 4 Analyze the depreciation of the asset

BFF3801
THERMAL-FLUID ENGINEERING LAB

Credit : 1 credit
Pre-requisite : Thermodynamics
 BFF2233, Fluid Mechanics BFF2223

Synopsis

This lab introduces practical application of basic thermofluid principles and the covered areas are the practical applications of pure substance, first law and second law of thermodynamics, refrigeration cycle, conduction heat transfer Bernoulli's theorem, flow trajectories over rigid body, friction losses in pipes, flow measurements, fluid pressure and boundary layer.

Course Outcomes

- CO 1 To recognize basic concept of thermodynamic and properties of pure substances.
- CO 2 To apply the first law of thermodynamics and able to solve energy balance and transfer problem, open-close system analysis.
- CO 3 To apply the second law of thermodynamic and able to employ the ideal principle Of Carnot heat engines, refrigerators and heat pumps in practical application.
- CO 4 To investigate and evaluate operating characteristics and performance of gas power cycles, vapor cycles, combined gas-vapor power cycles.
- CO 5 To solve basic heat transfer analysis of conduction in various medium.
- CO 6 Determine the buoyancy, stability and center of fluid pressure.
- CO 7 Apply Bernoulli's theorem.
- CO 8 Apply the concept of friction losses in pipes.

CO 9 Determine volumetric fluid flow using orifice and venturi.

CO 10 Apply the concept of static fluid pressure.

**BFF1921
ENGINEERS IN SOCIETY**

Credit : 1 credit

Pre-requisite : 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 Outcomes

CO 1 Determine the engineering profession and code of ethics

CO 2 Analyze the issues in local industries

CO 3 Analyze the working ethics and public responsibility

CO 4 Analyze the law which governing the engineering profession

**BFF3906
INDUSTRIAL TRAINING**

Credit : 6 credits

Pre-requisite : Third year student and achieved "Kedudukan Baik (KB)" status on current evaluation

Synopsis

The industrial training has to be completed in an industrial firm. The students work in current projects of the firm in the development, production or distribution process. The projects deal with manufacturing or related fields and allow the practical application of university knowledge. The training delivers insight into the future professional life.

Course Outcomes

CO 1 Comprehend how to use their acquired knowledge in practice

CO 2 Comprehend the operational processes in a firm.

**BFF4103
CONTROL SYSTEM ENGINEERING**

Credit : 3 credits

Pre-requisite : Vibrations BFF3103

Synopsis

This course introduces linear, time-invariant (LTI) control system modeling, analysis and design. The covered topics are state space modeling of dynamic systems; transient, stability and steady-state analysis; control system analysis and design using root-locus and frequency response techniques.

Course Outcomes

CO 1 Analyze and design control system compensators to achieve specified control system performances utilizing state-spacetechnique.

CO 2 Analyze and design control system compensators to achieve specified control system performances utilizing frequency-response technique.

CO 3 Analyze and design control system compensators to achieve specified control system performances utilizing root-locus technique.

CO 4 Analyze system performances.

BFM2313
DIGITAL ELECTRONICS

Credit : 3 credits

Pre-requisite : BFF1303

Synopsis

This course covers flip-flops, counters and registers, Integrated Circuit (IC) logic families, DAC/ADC and memory devices.

Course Outcomes

- CO 1 Design and analyze flip-flops circuit
- CO 2 Design and build counters and registers applications
- CO 3 Analyze Integrated Circuit (IC) logic families
- CO 4 Design and build ADC/DAC applications
- CO 5 Design and build memory device applications

BFM2303
ANALOG ELECTRONICS

Credit : 3 credits

Pre-requisite : BFF1303

Synopsis

This course introduces Junction Field-Effect Transistor (JFET), Metal Oxide Semiconductor Field-Effect Transistor (MOSFET), thyristor circuit and devices, waveform generator, wave shaping circuit, multivibrator, oscillator, timer and filter circuits.

Course Outcomes

- CO1 Analyze and solve JFET and MOSFET circuit.
- CO2 Analyze and solve thyristor circuit and thyristor devices.

CO3: Analyze and solve waveform generator and wave shaping circuit.

CO4: Analyze and solve multivibrator, oscillator and timer circuits

CO5: Analyze and solve filter circuits

BFM3503
PLC AND MICROCONTROLLED SYSTEM

Credit : 3 credits

Pre-requisite : BFF1303

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 Outcomes

- CO 1 Conduct input/output PLC interfacing.
- CO 2 Conduct PLC programming.
- CO 3 Conduct input/output microcontroller interfacing.
- CO 4 Conduct microcontroller programming.

BFM3403
FLUID DRIVE SYSTEM

Credit : 3 credits

Pre-requisite : BFF1303

Synopsis

This course introduces fluid drive system. This includes fluid power component functions. This course also design and build fluid drive system to perform specific requirements.

Course Outcomes

- CO 1 Realize fluid power component function
- CO 2 Design and build hydraulic system to perform specific requirement
- CO 3 Design and build pneumatic system to perform specific requirement.

BFM3303**ELECTRICAL DRIVE SYSTEM****Credit : 3 credits****Pre-requisite : BFF1303****Synopsis**

This course introduces generator and transformer circuits, DC motor analysis and design DC motor drive, and single and three phase motor drives analysis and design.

Course Outcomes

- CO 1 Analyze generator circuit
- CO 2 Analyze transformer circuit
- CO 3 Analyze DC motor and design DC motor drive
- CO 4 Analyze single phase AC motor and design single phase AC motor drive
- CO 5 Analyze three phase AC motor and design three phase AC motor drive.

BFM4733**COMPUTER-CONTROLLED OF MANUFACTURING SYSTEM****Credit : 3 credits****Pre-requisite : BFF1303****Synopsis**

This course introduces computer control application in manufacturing machines. This include modeling and analyzing processes in discrete form, designing controller based on discrete model, designing and implementing computer-controlled system, and designing and analyzing discrete control systems using transform methods.

Course Outcomes

- CO 1 Model and analyze processes in discrete form
- CO 2 Design controller based on discrete model
- CO 3 Design and implement computer-controlled system for manufacturing machines
- CO 4 Design and analyze discrete control systems using transform methods

BFM4902**FINAL YEAR PROJECT 1****Credit : 2 credits****Pre-requisite : Please refer to PSM handbook (Has passed more than 80 Credit hours)****Synopsis**

This course focuses on the real professional approach to engineering studies. Students will practice their engineering knowledge and technical skill from the previous training to solve engineering problems. The application of project management element as a medium for conducting and integration all expertise areas during the course run is highly encouraged.

Course Outcomes

- CO 1 Relate the proposed area to the learned courses
- CO 2 Establish techniques for literature review and independently perform the ability to gather information.
- CO 3 Define problem statement, objectives , scope , research methods with identification of appropriate tools.
- CO 4 Plan the project using project management tools i.e Gantt Chart
- CO 5 Communicate well on the work progress, presentation and in the final report.

BFM4914**FINAL YEAR PROJECT 2****Credit : 4 credits****Pre-requisite : Please refer to PSM handbook (Has passed more than 80 Credit hours)****Synopsis**

This course focuses on the real professional approach to engineering studies. Students will practice their engineering knowledge and technical skill from the previous training to solve an engineering. The application of project management element as a medium for conducting and integration all expertise areas during the course run is highly encouraged.

Course Outcomes

- CO 1 Design the experiment or questionnaire to start collecting data
- CO 2 Set-up and conduct the planned experiment or questionnaire
- CO 3 Interpret and analyse collected data

- CO 4 Plan the project using project management tools i.e Gantt Chart
- CO 5 Communicate well on the work progress, presentation and in the final report

MECHATRONICS (UMP-HsKA) PROGRAMME**BHM1103****STATICS****Credit : 3 credit****Pre-requisite : NONE****Synopsis**

This course introduces force vector algebra, equilibrium of forces on particle, equilibrium of forces on single rigid body and force analysis on simple frames and machine structures (multi-rigid bodies) and problems involving dry friction.

Course Outcomes

- CO 1 Solve equilibrium of forces on particle problems
- CO 2 Solve equilibrium of forces on single rigid body problems
- CO 3 Solve equilibrium of forces on structure problems.
- CO 4 Solve problems on centroid and moment of inertia.

BHM1113**ENGINEERING MATERIALS****Credit : 3 credit****Pre-requisite : None****Synopsis**

This course introduces the structure of metals and plastic deformation, the mechanical and physical properties of materials, the structure

and strengthening of metal alloys by heat treatment and the structures and properties of polymeric materials, ceramics and composite materials.

Course Outcomes

- CO 1 Analyze the structure of metals and plastic deformation.
- CO 2 Analyze the mechanical and physical properties of materials.
- CO 3 Analyze the structure and strengthening of metal alloys by heat treatment.
- CO 4 Analyze the structures and properties of polymeric materials, ceramics and composite materials.

BHM1602

TECHNICAL DRAWING

Credit : 2 credit

Pre-requisite : None

Synopsis

This course introduces basic technical drawing method, symbols and standards. Manual drafting and CAD software are used to produce drawing on assignments throughout the course.

Course Outcomes

- CO 1 Apply the standard needs to be followed when producing the drawing.
- CO 2 Produce the orthographic drawing including sectioning.
- CO 3 Apply the correct symbol and representations in the drawing.
- CO 4 Produce the assembly and detailed drawing.

BHM1801

MACHINING 1

Credit : 1 credit

Pre-requisite : None

Synopsis

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

Course Outcomes

- CO 1 Perform basic manual production techniques
- CO 2 Perform basic turning processes and operations according to the given dimensions, specifications and tolerances.

UHG1002

DEUTSCH SPRACHE 1

Credit : 2 credit

Pre-requisite : Intensive German Language Course July 2010-September 2010

Synopsis

This course enables to students to understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. They will be able to deal with most situations likely to arise whilst travelling in an area where the language is spoken. Students will be capable of producing simple connected text on topics which are familiar or of personal interest. Finally they can describe experiences and events, dreams, hopes & ambitions and briefly give reasons and explanations for opinions and plans.

Course Outcomes

- CO 1 Use sub-clauses and adjectives accordingly
- CO 2 Understand German language spoken by a native at natural pace
- CO 3 Extract key information from a text and paraphrase it
- CO 4 Make confident use of vocabulary related to core topics
- CO 5 Be aware of particularities of the German culture.

BHM1612**CAD MODELING****Credit : 1 credit****Pre-requisite : BFF1602****Synopsis**

This course introduces 3D surface solid modeling which emphasized on the drawing, functioning and organizing the model. Further course content included part assembly, animation and basic FEA application. Students experience the practical learning through the CAD software.

Course Outcomes

- CO 1 Apply modeling principle in product design
- CO 2 Produce 3D part models and standard technical drawing
- CO 3 Produce assembly models and drawing
- CO 4 Perform basic FEA simulation and animation.

BHM1811**MACHINING 2****Credit : 1 credit****Pre-requisite : None****Synopsis**

This course introduces student basic application of the measuring instruments, milling process and surface grinding.

Course Outcomes

- CO 1 Perform various basic milling operations safely.
- CO 2 Perform surface grinding process according to the given dimensions, specifications and tolerances.

UHG1012**DEUTSCH SPRACHE 1****Credit : 2 credit****Pre-requisite : UHG1002****Synopsis**

This course enables the students to understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisation. They can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Students will achieve the ability to produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.

Course Outcomes

- CO 1 Conduct grammatical transformation comprehensively
- CO 2 Understand complex German language spoken by a native at natural pace

- CO 3 Extract key information from a text and paraphrase it grammatically and lexically
- CO 4 Produce clear detailed text and intimate and clarify a position towards a topic
- CO 5 Be aware of particularities of the German culture.

BHM2603**CAD/CAM**

Credit : 3 credit
Pre-requisite : BHM1612

Synopsis

This course introduces the basic concept CAD/CAM system. The understanding of the of CAD/CAM concept and focus on different procedures in NC programming, the different geometry and the selection of the appropriate cycle and the proper tooling. Understanding the features and application of the various method of creating geometrical surfaces, free form surface and derived surface also ability to handle digitized data to constructed model. Use the available features to machine the different types of surfaces using 3-Axis and the application of tool containment boundaries during machining

Course Outcomes

- CO 1 Apply the CAD tool for geometric construction
- CO 2 Create 2D toolpath generation for different problems
- CO 3 Produce surface modeling using different technique
- CO 4 Apply different type cutting technique on surface modeling for roughing and finishing.

**BHM1123
DYNAMICS**

Credit : 3 credit
Pre-requisite : BHM1102
Synopsis

This course introduces principles of kinematics of a particle and a rigid body, kinetics of a particle and a rigid body utilizing force and acceleration method, work and energy method and impulse and momentum method.

Course Outcomes

- CO 1 Solve problems involving kinematics of a particle and planar kinematics of a rigid body.
- CO 2 Solve problems involving kinetics of a particle and planar kinetics of a rigid body utilizing force and acceleration method.
- CO 3 Solve problems involving kinetics of a particle and planar kinetics of a rigid body utilizing work and energy method.
- CO 4 Solve problems involving kinetics of a particle and planar kinetics of a rigid body utilizing impulse and momentum method.

BHM2003**COMPUTER PROGRAMMING**

Credit : 3 credit
Pre-requisite : None

Synopsis

This course introduces input and output, variables, constants, arithmetic operations and mathematical functions, user-defined functions, selection making decision and repetitive construct, and array data structure. The programming language used for the course is C language.

Course Outcomes

- CO 1 Write C program for input and output.
- CO 2 Write C program using variables, constants declarations, arithmetic operations and mathematics function.
- CO 3 Write C program using user-defined functions.
- CO 4 Write C program using selection making decision construct.
- CO 5 Write C program using repetitive construct.
- CO 6 Write C program using array data structure.

**BHM2313
DIGITAL ELECTRONICS**

Credit : 3 credit
Pre-requisite : BHM2801

Synopsis

This course covers flip-flops, counters and registers, Integrated Circuit (IC) logic families, DAC/ADC and memory devices.

Course Outcomes

- CO 1 Design and analyze flip-flops circuit
- CO 2 Design and build counters and registers applications
- CO 3 Analyze Integrated Circuit (IC) logic families
- CO 4 Design and build ADC/DAC applications
- CO 5 Design and build memory device applications.

**BHM2403
MANUFACTURING PROCESSES 1**

Credit : 3 credit
Pre-requisite : 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 Outcomes

- CO 1 Analyze metal-casting processes
- CO 2 Analyze forming processes
- CO 3 Analyze joining processes
- CO 4 Analyze material removal processes
- CO 5 Analyze surface technology processes

**BHM2203
THERMAL-FLUID ENGINEERING 1**

Credit : 3 credit
Pre-requisite : None

Synopsis

This course introduces basic principles of thermal-fluid science covering first law of thermodynamics, properties of pure substances, control volume analysis, second law of thermodynamics and entropy.

Course Outcomes

- CO 1 Solve thermodynamic problems involving closed system using first law of thermodynamics.
- CO 2 Determine the properties of pure substances.

- CO 3 Solve thermodynamic problems involving open system using first law of thermodynamics.
- CO 4 Solve thermodynamic problems involving second law of thermodynamics.
- CO 5 Apply entropy properties for thermodynamic analysis.

BHM2213 THERMAL-FLUID ENGINEERING 2

Credit : 1 credit
Pre-requisite : BHM2203

Synopsis

This course is the continuation of BFF2203 Thermalfluid I. It covers fluid and flowing fluids, similitude and dimensional analysis, heat transfer by conduction, convection and radiation.

Course Outcomes

- CO 1 Solve problems involving fluid statics.
- CO 2 Solve problems involving flowing fluids.
- CO 3 Use similitude, dimensional analysis and modeling to simplify experimental investigation of fluid mechanics.
- CO 4 Analyze heat transfer by conduction.
- CO 5 Analyze heat transfer by convection.
- CO 6 Analyze heat transfer by radiation.

BHM3302 SENSOR AND INSTRUMENTATIONS

Credit : 2 credit
Pre-requisite : None

Synopsis

This course covers PC-based data acquisition system to measure speed, position, temperature, strain, force and pressure. Extensive laboratory and group project.

Course Outcomes

- CO 1 Conduct PC-based data acquisition
- CO 2 Design and build instrumentation amplifier circuit.
- CO 3 Design and build instrumentation filter circuit.
- CO 4 Interface with sensors.

BHM3103 VIBRATIONS

Credit : 3 credit
Pre-requisite : None

Synopsis

This course introduces the fundamental of vibration, free vibration (Single Degree of Freedom - SDOF System), harmonically excited vibration (SDOF System), general excited vibration (SDOF System), two degree of freedom (TDOF System), and vibration control.

Course Outcomes

- CO 1 Analyze the single degree of freedom system vibration
- CO 2 Analyze the harmonically excited vibration of single degree of freedom system
- CO 3 Analyze the two degree of freedom system vibration

CO 4 Analyze the vibration control problems.

**BHM4113
CONTROL SYSTEM ENGINEERING**

**Pre-requisite
BHM3513**

Synopsis

This course introduces linear, time-invariant (LTI) control system modeling, analysis and design. The covered topics are state space modeling of dynamic systems; transient, stability and steady-state analysis; control system analysis and design using root-locus and frequency response techniques.

Course Outcomes

- CO 1 Analyze and design control system compensators to achieve specified control system performances utilizing state-space technique.
- CO 2 Analyze and design control system compensators to achieve specified control system performances utilizing frequency-response technique.
- CO 3 Analyze and design control system compensators to achieve specified control system performances utilizing root-locus technique.
- CO 4 Analyze system performances.

**BHM4922
ENGINEERING ECONOMY**

**Credit : 2 credit
Pre-requisite : None**

Synopsis

This course introduces concept of life cycle cost, interest and equivalent. Formula and factors for single and multiple cash flow. Method for investment assessment and

alternative comparison and project evaluation using cost worth ratio, inflation and cash flow method.

Course Outcomes

- CO 1 Analyze the engineering cost concept
- CO 2 Analyze the return to capital
- CO 2 Analyze the money-time relationship
- CO 4 Analyze the depreciation of the asset
- CO 5 Analyze the cost estimation and project evaluation

**BHM3603
PRODUCT DEVELOPMENT 1**

**Credit : 3 credit
Pre-requisite : NONE**

Synopsis

This course presents procedures and methods of engineering work, which are characterized by a team-oriented and systematic approach. Abstract technical thinking and a well-structured presentation of all the used operational functions as well as a critical evaluation of the developed alternative solutions not only prevent the unreflected use of already known patterns but indicate a way to achieve real innovations.

Course Outcomes

- CO 1 Prepare, complete and document complex design tasks
- CO 2 Formulate a problem and define design requirements
- CO 3 Determine and evaluate alternative solutions for the design requirements.

**BHM3613
PRODUCT DEVELOPMENT 2**

Credit : 3 credit
Pre-requisite : BHM3603

Synopsis

This course introduce the analysis of the functions, physical solutions, copyrights and related rights such as patents, verification of solutions, sketches and drafts of the product developed

Course Outcomes

- CO 1 Solve an actual technical problem
- CO 2 Perform a patent analysis
- CO 3 Design a business process
- CO 4 Present the solution in an enterprise

**BFM4503
ROBOTICS FOR ENGINEERS**

Credit : 3 credit
Pre-requisite : NONE

Synopsis

This course introduces robot kinematics, robot dynamics, robot control and robotic arm programming.

Course Outcomes

- CO 01 Derive robotic arm kinematics matrix.
- CO 02 Derive robotic arm dynamics equation
- CO 03 Analyze robot control system.
- CO 04 Perform robotic arm programming