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

Prof. Madya Dr. Wan Azhar bin Wan Yusoff
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**PROGRAMME CURRICULUM**  
**BACHELOR OF MANUFACTURING ENGINEERING**

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**Total Unit For Graduation:** 129

**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 Skill 2
- Co-Curriculum I
- Co-Curriculum II
- Technopreneurship
- Elective Social Science

**# Elective Subjects:**
- Power Electronics
- Electrical Power and Machines
- Artificial Intelligence System
- Robotic for Engineers
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**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,

**Total Unit For Graduation**: 139
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.

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.

**BFF123**  
**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

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

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.
CO 3 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 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

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 / 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 electromechanical 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

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

CO1: Solve the stress and strain in structural members subjected to axial loads.
CO2: Solve the stress and strain in structural members subjected to torsional loads.
CO3: Solve the stress and strain in structural members subjected to bending loads.
CO4: Solve the stress and strain in structural members subjected to shear loads.
CO5: Solve the stress and strain in structural members subjected combined loads.
CO6: 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 INTRUMENTATIONS
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 introduce 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 thermalfluid 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  : CADCAMCAE 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  : CADCAMCAE 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 introduce 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) apply 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**

CO 1 To develop an understanding of Total Quality and how to manage quality with statistical tools.

CO 2 To gain insight on TQM philosophies, strategies and important quality concepts such as customer focus, team working, employee empowerment and continuous improvement.

CO 3 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**

CO 1 Analyze various existing and new metal stamping process.

CO 2 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

CO1  Design and analyze the drawing product design and the drawing operation

CO2  Analyze the mechanics of sheet metal forming related to drawing operation and design the drawing die

CO3  Fabricate the components of drawing die

CO4  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

CO3  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.
bf1602
**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.

bf1612
**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.

bf1801
**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.

bf1811
**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 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

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 3  Design, analyze and build digital electronic system.

CO 5  Design, analyze and build electromechanical 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

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

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 Materials 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 INTRUMENTATIONS
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.

BFF3801
THERMAL-FLUID ENGINEERING LAB
Credit : 1 credit
Pre-requisite : Thermodynamics BFF2233, Fluid Mechanics BFF2223

Synopsis
This lab introduces practical application of basic thermalfluid 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.

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
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.
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.

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**

**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 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 INTRUMENTATIONS**
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