

1	GLRB 0010	Design Thinking for Entrepreneur (DTE)
2	GLRM 0010	Talent and Competency Management (TCM)
3	GLRL 0010	English Communication Skills for Graduating Students (ECS)
Elective PSC Courses (Choose 2 Only)		
1	GLRT 0010	Data Analytic for Organization
2	GLRT 0020	Professional Ethics and Integrity
3	GLRT 0030	Construction Measurement (Mechanical & Electrical)
4	GLRT 0050	OSHE for Engineering Industry and Laboratory
5	GLRT 0060	Quality Management for Built Environment and Engineering Professionals
6	GLRT 0070	Safety and Health Officer Introductory Course
7	GLRM 0020	Industrial Machinery and Lubrication

Course Synopsis - Core Courses

SKMJ 1013 - Computational Thinking and Programming

This introductory programming course is designed for undergraduate engineering students. The course will cover fundamental programming concepts and techniques, using the Python programming language as a primary tool. Students will learn to write code for solving basic engineering calculations, creating informative data visualizations, and developing simple user interfaces. Additionally, students will gain brief exposure to other programming languages widely used, as well as other emerging platforms (AI Agents). The coding will primarily conduct within a Linux-based operating system environment during the lecture and hands-on session, emphasizing command-line proficiency and system interaction, and will utilize Raspberry Pi hardware to reflect the increasing use of these platforms in engineering innovation and embedded systems development. The course project allows students to apply their newfound programming skills to a practical engineering problem.

SKMJ 1113 - Solid Mechanics I

The course provides students with the knowledge to determine the strength and stiffness of structures being used. The structures that will be studied in this course are bars, pins, bolts, shafts and beams and the types of applied loadings are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. In addition, they should be able to solve problems related to statically determinate and indeterminate structures.

SKMJ 1203 - Statics

The course introduces students to the part of mechanics which considers the action of forces in rest or equilibrium. It will emphasize on the fundamental concepts related to force system and moments applied to the equilibrium of particles and rigid bodies. This includes problems related to the conditions of frames, structures, mechanisms and machines at rest. Students are also exposed to the concept of friction and its effect on machines. At the end of the course, students should be able to analyse forces acting on simple structures and mechanisms in the state of equilibrium both in 2D and 3D domains. Students should also be able to demonstrate and apply the knowledge to continuing subjects that requires the analytical skills developed in this course.

SKMJ 1213 - Dynamics

The course is an extension to Statics, which is the pre-requisite to this course. It introduces students to the part of mechanics which considers the action of forces in producing motion. This course provides an exposure to students on the theory of the kinetics and kinematics of particles and rigid bodies. The concepts of energy, work, momentum and impulse are also introduced. At the end of the course, the students should be able to apply the principles to study and analyse the behaviour and responses of dynamical systems. They should also be able to solve the dynamic problems related to the determination of forces, energy and power to move a body.

SKMJ 1223 - Introduction to Mechatronic Systems

This course is designed to introduce mechanical engineering students to the fundamental principles of electrical technology and electronics. This course provides a comprehensive understanding of both DC and AC circuits, operational amplifiers, relays, motors, and solenoids. At the end of this course, through a blend of theoretical concepts and practical applications, students will gain the foundational knowledge necessary to integrate electrical and electronic components into mechanical systems.

SKMJ 1413 - Thermodynamics

Thermodynamics is a foundational science that explores the principles governing energy, its transformations, and its interactions with matter. This course introduces students to the core concepts and laws of thermodynamics, including forms of energy, energy transfer mechanisms, and the properties of pure substances. Students will learn to apply the first and second laws of thermodynamics to analyze and solve problems involving closed and open systems, cycles and thermodynamic devices. By the end of the course, students will be able to explain fundamental thermodynamics concepts, evaluate the performance of cycles and devices, interpret property data, preparing them for further studies and careers in engineering and related fields.

SKMJ 1503 - Engineering Modelling and Drawing

This course introduces students to the principles of engineering drawing and tolerance practices following British and ISO standards. It emphasizes creating well-proportioned 2D and 3D sketches for effective visual communication, using advanced CAD software to produce standard-compliant drawings. Students will explore orthographic, isometric, and sectional views, develop solid models with tools like extrude and revolve, and engage in assembly mode to construct mechanism designs. Practical projects include generating detailed portfolios, applying geometric tolerancing, and creating clear production drawings, including exploded views and bills of materials, to demonstrate their proficiency in engineering drawing.

SKMJ1902 - Engineering Principles and Practice

In this course, students will learn to identify key engineering principles that influence mechanical engineering problems. They will formulate product design specifications that address specific design needs and problem definitions. Students will generate a diverse range of concepts aligned with these specifications and refine their ideas to establish a final concept through screening and synthesis. The course includes building a physical working model to demonstrate the functional capabilities of the design. Finally, students will enhance their communication skills by presenting their design and its performance through oral and written formats. This course emphasizes critical thinking, creativity, and hands-on experience in engineering design.

SKMJ 2123 - Solid Mechanics II

The course is an extension to Solid Mechanics 1, which is the pre-requisite to this course. It aims to extend the student's knowledge and understanding of the behaviour of materials and structures under a variety of loading conditions. The course starts off with plane stress and plane strain transformations, following which several elastic failure criteria are investigated. The course provides an opportunity to investigate thick cylinders, structural deformation behaviour by using the energy method, instability problems of struts and elasto-plastic bending of beams. Determinate and indeterminate problems will be examined. At the end of the course, students should be able to calculate and evaluate stress, strain, and deformation of structures in normal loading, torsion and bending. They should also be able to evaluate failure modes and estimate fracture life of structures and components. The aspect of designing safe components and structures will also be emphasized to the students.

SKMJ 2213 - Measurement System and Sensors

The course shall cover the essential and basic theory of one of the mechatronic components, i.e., instrumentation, measurement and data analysis. In this course, student will learn the fundamental components of instrumentation system, characteristics of instrumentation system, signal conditioning, application of sensors in engineering measurements and statistical data analysis

SKMJ 2223 - Machine Dynamics and Vibration

The course requires Dynamics as the pre-requisite. It is designed to expose students to the application of concepts in mechanics (Statics and Dynamics) to solve real world of mechanical engineering problems pertaining to machines involving gear trains, gyroscope, flywheel, and balancing of rotor and reciprocating mass. The concept of vibration is also studied through one degree of freedom (DOF) and two DOFs problems. At the end of the course, the students should be able to solve problems related to various mechanical systems.

SKMJ 2233 - Control Engineering

This course introduces the basics of control engineering, blending theory with practical experience. Students will gain fundamental concepts in control engineering, such as system modelling, analysis, and controller design. The course will cover mathematical modelling techniques using first principal methods, as well as approaches to obtain system transfer functions and derive system responses. Key analysis topics such as time response, stability, and frequency response will also be addressed. Additionally, students will learn to design controllers based on system requirements and use MATLAB and Simulink software to solve real-world problems.

SKMJ 2313 - Fluid Mechanics I

The principle aim of this course is to provide students with an understanding of the properties of fluids and to introduce fundamental laws and description of fluid behavior and flow. It will emphasize on the concept of pressure variation, fluid at rest and its application in the measurement of pressure, static force due to immersed surfaces, buoyancy and stability analysis. Dynamic flow analysis inclusive of technique in solving flow problems is introduced to solve flow measurement, conservation of mass, energy, momentum equation in flow and loss in pipe network. Lastly, some basic dimensional analysis and similarities will be introduced. At the end of the course, the student should be able to demonstrate an ability to analyze whether statically, dynamically or kinematically problems related directly to fluids.

SKMJ 2323 - Fluid Mechanics II

This course is designed to enhance the basic knowledge that has been developed in the first stage of Fluid Mechanics and expose the students in analysing hydrodynamically the flow field. It will emphasize on the analysis and the importance of ideal, boundary layer, and compressible flow in a practical engineering application. The course will also provide the analysis of flow through fluid machines such as pump and turbine. At the end of the course, students should be able to demonstrate and apply the theory to solve problem related to flow of fluids through project based.

SKMJ 2423 - Engineering Thermodynamics & Heat Transfer

This course aims to develop a fundamental understanding of the processes by which heat, and energy are inter-related and converted and by which heat is transferred. The course will review major principles of energy conversion and the modes of heat transfer. The basic laws of thermodynamics and the governing equations for heat transfer and thermodynamics will be introduced and subsequently used to solve practical engineering problems involving thermodynamics and heat transfer. Students will also learn the fundamental principles of power generation systems.

SKMJ 2613 - Materials Science

This course introduces students to the fundamentals of materials science and engineering with emphasis on atomic bonding, crystal structures and defects in metals. It will introduce students to the various classes of materials including metals, ceramics, polymers, and composites and their fundamental structures. The course will also provide basic diffusion mechanisms, metal solidification, phase diagrams and heat treatment processes. By the end of the course, students will be equipped to apply their understanding of atomic bonding and crystal structures to predict the physical and mechanical behavior of materials. They will also be able to utilize phase diagrams and heat treatment principles to design and optimize material processing, tailoring the structure of materials to achieve specific properties.

SKMJ 2912 - Engineering Laboratory

This experimental based course is introduced in second year of the Mechanical Engineering programme. Guided experiments are conducted in four laboratories: Strengths of Materials Laboratory, Thermodynamics Laboratory, Mechanics of Machines Laboratory and Fluid Laboratory. Students will be grouped into 4 to 5 persons for each experiment. The experiments are based on the theory taught in the related courses in the same/adjacent semester. At the end of this course, student's understanding on fundamental concepts learned in class is cemented through conducted experiments.

SKMJ 3023 - Applied Numerical Methods

This course trains students in solving complex engineering problems through a systematic approach of mathematical modelling, numerical solution implementation, and critical result interpretation. Students will master essential computational techniques for addressing real-world challenges across applied mechanics, strength of materials, thermal science, and fluid mechanics. The course covers key numerical methods including solving nonlinear equations, simultaneous linear algebraic equations, eigenvalue problems, data interpolation, numerical differentiation and integration, and techniques for initial value, boundary value, and partial differential equation problems. Students will develop the analytical judgment to select optimal solution strategies for diverse engineering scenarios, preparing them for technical leadership in industry and research environments.

SKMJ 3513 - Elements of Mechanical Design

This course introduces the elements of mechanical design, encompassing both physical components and fundamental design principles essential to engineering applications. The hard elements covered include shafts, gears, V-belts, bearings, bolted joints, and welded joints, with a focus on their selection, design, and performance analysis. Complementing this, the soft elements introduce key analytical tools such as three-dimensional free-body diagrams, yield and fatigue design theories, and fundamental design philosophies to ensure structural integrity and functionality under various loading conditions. The course integrates theoretical analysis with computational tools, including Finite Element Analysis (FEA) in SolidWorks, to validate design decisions. Through the course project, students will apply these mechanical design elements in practical engineering scenarios, bridging theoretical knowledge with real-world applications.

SKMJ 3524 - Integrated Engineering Design I

This course enhances students' proficiency in design process and practices through collaborative teamwork. Students engage in a serial design project spanning two courses: Integrated Engineering Design I (IED I) and Integrated Engineering Design II (IED II). In IED I, the primary focus is to formulate the product design specification in alignment with market opportunity surveys, world sustainability goals (SDG17), Engineering Accreditation Council (EAC) goals, and problem identification. Students will generate a wide range of innovative concepts that align with the product design specification, and then refine the final concept through screening, reflection, scoring, and synthesis processes. They will also acquire knowledge about integrating sensors, actuators, and controllers, as well as utilising PLCs, microcontrollers, and data acquisition systems for their designs. Finally, students will build a physical working model to verify the concept's functional capabilities. The verified concept from IED I will be carried forward to IED II for the detailed design process.

SKMJ 3534 - Integrated Engineering Design II

This course offers a comprehensive exploration of the advanced engineering design process, covering component clarification, material selection, design efficiency, and manufacturing. Students will develop detailed documentation, optimize designs for manufacturability, conduct engineering analyses and simulations, and create accurate engineering drawings. The course includes prototyping development, extensive testing, and refinement to ensure product performance. Emphasizing collaborative teamwork, students will solve complex design challenges, develop strategic product launch plans, and effectively communicate project achievements through written reports and presentations, culminating in a final design showcase demonstrating innovation and success.

SKMJ 3622 - Materials Technology

This course introduces students to the basic concepts required to understand and describe the mechanical behavior and failure mechanism of metals. It will emphasize on the concept of stress intensity factor and fracture mechanics to predict failure of materials and provide understanding on conditions under which fatigue and creep occur. The course will also introduce students to the theory of electrochemical corrosion in metallic materials, estimate the corrosion rate and understand the methods to control and manage corrosion. By the end of the course the student should be able to apply the criteria of failure to the design of materials and conduct failure analysis of engineering components. This course also covers the properties, processing and applications of non-metallic materials mainly polymer, ceramic and composite.

SKMJ 3713 - Manufacturing Processes

This course discusses the fundamental aspect of various traditional and non-traditional manufacturing processes for processing metal and non-metal components as well as sustainable manufacturing concepts. It starts from the overall introduction on manufacturing aspects including GD&T, followed by polymer, casting, joining, metal forming, and machining processes comprising CNC/CAD/CAM technologies. At the end of this course, the students should be able to select suitable manufacturing processes to produce a part/product. The knowledge gained from this course also allows students in making right decision in designing products based on process requirements.

SKMJ 3813 - Integrated Operations Management

This course introduces students to foundational theories, principles, and techniques in industrial engineering, emphasizing their importance in optimizing production and operations. Key topics include forecasting, which aids in demand prediction, and capacity and materials planning, which ensure resources align with organizational needs. The course also covers scheduling, inventory management, productivity and work measurement, and layout design, providing students with a broad understanding of how to manage and improve production systems effectively. Students will explore issues related to managing quality through Statistical Process Control (SPC), gaining skills to monitor and control product quality. Various calculations and measurements are introduced to support data-driven decision-making, fostering a practical approach to solving industrial engineering problems. Additionally, the course briefly introduces students to the overall discipline of industrial engineering, offering insights into how these principles apply in real-world scenarios. By the end of the course, students will have developed a comprehensive understanding of industrial engineering techniques, enabling them to analyze and address operational challenges within organizations. Through theoretical learning and practical applications, students will be equipped with the skills needed to make effective decisions that enhance productivity, quality, and efficiency in industrial settings.

SKMJ 3915 - Industrial Training

Industrial training exposes students to the work environment in relevant industries for 10 to 12 weeks. Learning is done through experiential learning approach, which requires the students to learn the industrial process and relate back to prior knowledge acquired in class. The students are expected to gain hands-on experience not only in the engineering aspects of work but also in other related areas; such as administration, finance, management, safety, etc. The knowledge gained during practical training may be used in final-year classes or final-year projects. The real-world experience would equip students with sufficient knowledge, experience and confidence for job interviews.

SKMJ 3912 - Engineers and Society

This course requires students to plan and undergo academically relevant service activities that address community needs through a combination of academic and hands-on experiences. Students need to analyze community requirements, assessing environmental implications, and providing personalized technological solutions. Students collaborate with local stakeholders, combining technology advancements with social, economic, and environmental concerns. Topics cover project planning, resource management, project development, and implementation. Students enhance their critical thinking, problem-solving, and communication abilities by working on real-world projects.

SKMJ 4902 - Engineering Professional Practice

This course introduces students to engineering ethics and an engineer's responsibilities towards safety, health and welfare of the public. It places emphasis on the engineer to abide to the code of ethics and professional conduct, standards, laws and regulations pertaining to professional engineering practices. At the end of the course, students should have the awareness and able to live by the engineering professional ethics in their future career as an engineer.

SKMJ 4912/SKMJ 5912 - Final Year Project I

This research-based course introduces the final year students on how to do academic research on their own by applying knowledge and skills they acquired from other courses. Given to a topic on a project, students must identify a problem, gather relevant information to the problem and propose solution to problems. In this course, students must do some literature surveys to understand the nature of the problem and investigate work done by other researchers in line with their work. The students are also required to propose a methodology on how to solve the problems. By the end of this course, the students are expected to submit and present their research proposal to be assessed by their supervisors and panel of assessors.

SKMJ 4924/SKMJ 5924 - Final Year Project II

This research-based course is the continuation of Final Year Project I (FYP I) course. It enhances the students' knowledge and ability to identify and solve problems through academic research. It will provide an exercise for the student in carrying out research with minimum supervision and ability to plan and manage their work effectively. This course will also develop the students' capability to present, discuss and analyse results of the research clearly, effectively and confidently in both oral presentation and in dissertation.

SKMJ 4932 - Integrated Laboratory

This experimental based course is introduced in fourth year of the Mechanical Engineering programme. It is divided into two open ended experiments (project-based learning laboratory module) depending on the topics/labs assigned. Students have to plan and design their own experimental work right from the very beginning until the end of the module based on the topics given by lecturers. Students will be grouped into 4 to 5 persons for each module. At the end of this course, students will learn how to independently plan and conduct experiments in groups.

Course Synopsis - Elective Courses**SKMJ 4213 - Mechanical Vibration**

This course covers the analysis and modelling of mechanical vibrations in single and multi-degree-of-freedom (DOF) systems, emphasizing damping effects, forced and free response, and vibration control techniques. Key concepts include natural frequencies, mode shapes, resonance, and orthogonality in discrete and continuous systems. Practical applications are reinforced through experimental vibration measurement techniques, including accelerometer-based data acquisition, signal conditioning, and spectral analysis. Upon completion of this course, students will be able to analyze and design vibration systems, determine natural frequencies and mode shapes for complex mechanical structures, implement appropriate damping and vibration control strategies, conduct experimental vibration measurements using modern instrumentation, and apply spectral analysis techniques to solve real-world vibration problems.

SKMJ 4223 - Acoustics and Noise Control

This course prepares the future engineers with the physical principles acoustics and noise together with the tools and analysis techniques for noise measurements. Students will be taught on the physics of sound, measurement instrumentations, analysis techniques, sound/noise inside room & enclosure, transmission of sound/noise through structure and outdoor sound/noise. Students will also be introduced and exposed to the typical noise measurement instrumentations available in the noise laboratory. International and domestic noise regulations are also highlighted. The project/s assigned to students during this course requires understanding on the basic principles of noise along with the use of noise measurement instrumentations and data analysis. At the end of this course, students should understand thoroughly all the underlying physical principles of noise and should be able to measure and analyse noise levels whenever required.

SKMJ 4233 - Mechanism and Linkages

This course introduces fundamental concepts and techniques for analyzing and synthesizing motion in mechanisms and machines. Building upon the principles of velocity and acceleration covered in first-year studies, students will learn to evaluate the motion of mechanical systems through theoretical and practical approaches. Key topics include linkages, cam-follower systems, gear kinematics, and mechanism design, with an emphasis on real-world applications. Upon completion of this course, students will be able to analyze complex mechanical systems using both analytical and graphical methods, design functional linkage mechanisms that achieve specified motion requirements, evaluate and optimize cam-follower systems for various applications, perform comprehensive kinematic and dynamic analyses of gear trains, apply computational tools to simulate and visualize mechanism behavior, and synthesize complete mechanical systems that effectively address practical engineering challenges.

SKMJ 4243 - Advanced Control Engineering

This course shall cover the essential and basic theory of design and analysis of control system that are not covered in Control Engineering. It shall cover the followings: cascade compensation using lead and lag compensator, nonlinear system analysis, discrete system and state-space analysis. MATLAB and Simulink software package shall be taught and used as a tool in solving control engineering problems throughout the course. Upon completion of this course, students will design cascade compensation using lead and lag compensators, analyze nonlinear systems, apply discrete-time techniques, and develop state-space models for control systems. Students will utilize MATLAB and Simulink to solve advanced control problems, evaluate compensated system performance, and implement theoretical concepts in practical applications.

SKMJ 4263 - Machine Learning

This course delivers a concise exploration of machine learning fundamentals, encompassing both supervised and unsupervised learning paradigms while providing hands-on experience with key algorithms. Students will master the critical data preparation pipeline including cleaning, feature engineering, and normalization, essential for effective model development. The curriculum covers advanced deep learning architectures, with particular emphasis on deep neural networks and convolutional neural networks for complex pattern recognition tasks. Upon completion, students will demonstrate proficiency in implementing end-to-end machine learning solutions, from data preparation through model development to performance evaluation, enabling them to tackle real-world problems using appropriate machine learning techniques.

SKMJ 4273 - Robotics

This course equips undergraduate students with comprehensive understanding of robotics fundamentals, covering robot anatomy, configuration, components, programming methods, and performance specifications. Students explore analytical aspects of robot manipulators through kinematics, statics, and dynamics analysis essential prerequisites for mechanical design, trajectory planning, and control system development. The curriculum advances to control algorithms addressing system stability, accuracy, and robustness, with emphasis on mathematical modelling and simulation techniques. Select case studies of real-world robotic systems reinforce theoretical concepts through practical application. Upon completion, students will demonstrate proficiency in analyzing robotic systems, designing appropriate control strategies, and applying mathematical models to solve complex robotics engineering challenges.

SKMJ 4283 - Intelligent Robotics

This course provides undergraduate students with essential knowledge of intelligent robotics, examining fundamental components including controllers, dynamic chassis, actuators, and sensors. Students develop analytical capabilities through simulation-based analysis of robot dynamic models and motion controllers, with special emphasis on artificial intelligence applications across robotic domains. The curriculum explores AI integration in path planning, localization, positioning, mapping, navigation, and vision systems, connecting theoretical principles to practical implementation. Upon completion, students will demonstrate the ability to analyze intelligent robotic systems, design appropriate AI-based control strategies, and implement solutions for complex robotic challenges requiring autonomous decision-making capabilities.

SKMJ 4313 - Turbomachinery

This comprehensive course on turbomachinery fluid mechanics focuses on practical equipment commonly encountered in industrial mechanical engineering, compressors, blowers, fans, pumps, and wind turbines. Students will master fundamental fluid mechanics principles essential for developing and applying analytical and empirical relationships in turbomachinery, analyze flow patterns through various fluid machines, and learn to select optimal machine types for specific applications with preliminary estimates of speed, size, and performance characteristics. By course completion, students will be able to effectively compare and select appropriate fluid machines for diverse operational requirements.

SKMJ 4343 - Hydraulic Machine and Pipe System

This advanced fluid mechanics course deepens students' understanding of water flow dynamics, focusing on open channel principles and flowrate calculations. It covers essential elements of steady, quasi-steady, and unsteady pipe flow applied to practical problems in pipelines and networks, with emphasis on flow distribution analysis using the Hardy-Cross method. Students will study pressure wave phenomena, water hammer analysis, and the critical relationship between pump operations and pipe systems. The course examines various pump types; centrifugal, axial, and positive displacement in providing comprehensive analysis of their characteristics and applications. Upon completion, students will be able to analyze complex hydraulic systems, select appropriate pump technologies for specific requirements, and solve practical water flow engineering problems.

SKMJ 4353 - Lubrication

This comprehensive course explores the physical principles of classic hydrodynamic lubrication theory as the foundation for effective bearing design. Students will examine applications to thrust, journal, and squeeze film bearings, along with hydrostatic lubrication systems. The curriculum covers various hydrodynamic bearing types and their operational characteristics, lubricant properties, steady state hydrodynamic lubrication theory, and practical applications of hydrostatic and squeeze film lubrication to slider and journal bearings. Design considerations including side leakage and thermal balance are thoroughly addressed. Upon completion, students will be able to analyze lubrication systems, select appropriate bearing configurations for specific applications, and design optimal lubrication solutions that account for mechanical, thermal, and fluid dynamic constraints.

SKMJ 4413 - Battery Energy Storage System

This course offers a comprehensive foundation in Battery Energy Storage Systems (BESS), covering current trends and future demands in energy storage. Students will explore practical applications, essential battery concepts, and terminology, while examining battery operation, performance, and evolving chemistries to meet sustainability standards. Key topics include thermal management for safety and longevity, fire prevention, battery management systems (cell balancing, overcharge protection), battery modelling for performance prediction, and module architecture for reliability. By the end of the course, students will be able to design, implement, and manage BESS effectively across diverse applications, addressing both present and future energy storage challenges.

SKMJ 4423 - Power Plant Engineering

This course provides a foundational understanding of conventional and renewable power generation, covering key principles, component identification, and the latest developments in power plants and energy storage technologies. Students will explore current energy supply trends, economic considerations in power plant development and operation, critical equipment such as steam generators and gas turbines, conventional fuel types, and related technologies. By the end of this course, students will gain a clear grasp of both traditional and renewable energy systems, their operational dynamics, and their role in modern and future energy landscapes.

SKMJ 4433 - Advanced HVACR

This course delivers a comprehensive study of Heating, Ventilation, Air Conditioning, and Refrigeration (HVACR) systems, blending theory and practice for real-world engineering applications. Students will master fundamental HVACR principles, analyze vapour-compression refrigeration cycles, and evaluate refrigerant environmental impacts, including next-generation alternatives. Through psychrometric analysis, they will examine air conditioning processes, perform ASHRAE-compliant building heat load calculations, and assess thermal comfort and indoor air quality for optimal environments. The course also covers air distribution systems, including duct design and sizing using fluid mechanics and modern industry techniques. By the end of the course, students will be proficient in designing, analyzing, and optimizing HVACR systems for contemporary engineering challenges.

SKMJ 4443 - Thermal Fluids System Design

The course first reviews the fundamentals of fluid mechanics, thermodynamics, and heat transfer, which are necessary as the basis for the design of thermal fluid systems and heat exchanging devices. Cooling and heating components require fast and accurate design procedures to achieve effective and efficient systems, considering global concerns for a sustainable environment. The course provides a systematic approach to basic principles, component identification and description, solution strategies, modelling, and optimization (where applicable) of general macro-to-micro design of heat exchanging devices for present and future applications. This is followed by the theory and design of specific heat exchangers, which are vital in power generation, process and chemical industries, as well as heating, ventilation, air-conditioning, refrigeration, and electronic system cooling. By the end of the course, students will be able to select, analyze, and design various types of heat exchangers, focusing on thermo-hydraulic design, performance ratings, and operational problem-solving, thereby equipping them with the skills to address real-world engineering challenges.

SEMM 4333 - Computational Fluid Dynamics

This course introduces students to fundamentals and practical skills of Computational Fluid Dynamics (CFD). The governing equations of fluid flow and their mathematical classification are introduced. The course will also provide the basic concept of CFD and numerical procedures such as Finite Difference Method (FDM) and Finite Volume Method (FVM). Students are also exposed to practical issues associated with the implementation of the use of CFD codes, such as turbulence modelling, boundary conditions, and the importance of verification and validation. At the end of the course, students should be able to demonstrate and apply the theory to solve problem related to complex flow of fluids using open source and commercial CFD codes.

SKMJ 4453 - Combustion Process

This course provides a foundational understanding of heat-energy interrelations, conversion processes, and heat transfer mechanisms, covering key principles of energy conversion and heat transfer modes. Students will explore the basic laws of thermodynamics and governing equations for heat transfer, applying them to solve practical engineering problems. Additionally, the course introduces fundamental principles of power generation systems. By the end of the course, students will be able to analyze thermodynamic systems, apply heat transfer equations, and evaluate energy conversion processes in engineering applications.

SKMJ 4463 - Energy and Environment

The course investigates global energy use and supply, climate change, and sustainable development challenges. Analysis of the consequences on our environment will be done and students will compare and assess emerging energy technologies and design solutions to address the global issues. After successful completion of this course, students would be able to apply the acquired knowledge to work out environmental implications in dealing with energy related services and play appropriate role to serve the environmental and societal interests by minimizing the negative impacts.

SKMJ 4513 - Computer Aided Design

This course covers the fundamental concepts of computer-aided design (CAD) with a focus on mechanical engineering applications, teaching students to use industry-standard CAD software for creating 2D and 3D models of mechanical components and assemblies. Key topics include parametric modelling, surface and sheet metal design, assembly fabrication, finite element analysis (FEA), kinematic and dynamic simulations, design automation, and design for manufacturing (DFM). Through hands-on projects, students will learn to conceptualize, design, and optimize mechanical systems, preparing them for careers in engineering design and product development. By the end of the course, students will be able to proficiently use CAD tools for modelling and simulation, apply advanced design methodologies, and develop optimized mechanical systems for real-world engineering challenges.

SKMJ 4523 - Design Optimization

This course offers a foundational overview of engineering optimization, covering problem formulation, algorithm classification, and visual optimization using MATLAB. Students will explore one-dimensional optimization (non-gradient and gradient-based methods, root-finding), multi-dimensional optimization (direct and indirect methods), and constrained optimization (Kuhn-Tucker conditions, indirect/direct methods), along with heuristic techniques like genetic algorithms and simulated annealing. The course culminates in a design optimization project, applying theoretical knowledge to real-world problems. By the end of this course, students will be able to formulate optimization problems, select and implement appropriate techniques, and apply them to practical engineering challenges using MATLAB.

SKMJ 4533 - Mechanical Design and Industrial Practices I

This elective course, under the design track, introduces fundamental principles of mechanical design aligned with industrial best practices, focusing on the initial phase of the IQIP mechanical design process. Students will learn to gather requirements, develop conceptual designs, and create preliminary solutions while leveraging existing designs, standards, and best practices for efficiency and quality. The course bridges academia and industry by facilitating interactions with engineers and top management, enhancing real-world communication and decision-making skills. By the end of this course, students will be able to apply structured design methodologies, generate viable conceptual solutions, and effectively present ideas using industry-relevant practices.

SKMJ 4543 - Mechanical Design and Industrial Practices II

This course aims to equip students with a thorough comprehension of the complex design process by applying it to product development within IQIP industries. This course emphasises the ongoing execution of conceptual design that was introduced in Part 1 of the previous semester. This semester, the design process remains centred on the fundamental and complex elements of both basic design and detailed design. The design aspect is reinforced by the communicative documentation, which delineates the manufacturing process and employs established standards and procedures. This encompasses considering several engineering design variables, including detail drawing, equipment selection, production procedures, and tender paperwork. Upon completion of this course, students will acquire the proficiency to employ their knowledge in generating industrial drawings using CAD applications that conform to industrial standards.

SKMJ 4553 - Advanced Design Analysis

This course delves into the analytical foundations of mechanical design, equipping students with the skills to evaluate and enhance design performance through rigorous assessment of materials, components, and subsystems including manufacturability, risk, and safety considerations. Using case studies, prototype testing, and functional evaluations, students will diagnose design flaws, optimize solutions, and document their analyses with precision. Emphasis is placed on iterative refinement, data-driven decision-making, and professional technical communication to simulate real-world engineering challenges. By the end of this course, students will be able to conduct critical design analyses, implement performance improvements, and produce clear, actionable technical documentation for mechanical systems.

SKMJ 4563 - Design and Prototyping Integration

This course focuses on advanced prototyping techniques and seamless design integration, guiding students through concept solution iteration, practical material selection, and system development. Emphasizing practical innovation, students will refine their designs into functional prototypes while mastering system integration and visualization. By the end of the course, students will produce integrated prototypes and comprehensive documentation, showcasing their ability to merge creativity with manufacturability.

SKMJ 4513 - Computer Aided Design

This course is designed for students to gain knowledge on what is going on behind the screen of Computer Aided Design Software. This understanding makes the learning curve of new CAD software shorter as the students may be using other CAD software later when they work. Furthermore, the course will also expose the students on the capability of the programming within CAD software. With the programming knowledge, students will be able to model as well as using the programming to integrate engineering knowledge to CAD.