MECHANICAL ENGINEERING (22 SCHEME)	
Course Code	**BIDTK158/258 - INNOVATION and DESIGN THINKING**
CO1	Appreciate various design process procedure
CO2	Generate and develop design ideas through different technique
CO3	Identify the significance of reverse Engineering to Understand products
CO4	Draw technical drawing for design ideas
Course Code	**BCEDK103/203 - Computer Aided Engineering Drawing**
CO1	Draw and communicate the objects with definite shape and dimensions
CO2	Recognize and Draw the shape and size of objects through different views
CO3	Develop the lateral surfaces of the object
CO4	Create a Drawing views using CAD software.
CO5	Identify the interdisciplinary engineering components or systems through its graphical representation.
Course Code	**BEMEM103/203 - ELEMENTS OF MECHANICAL ENGINEERING**
CO1	Explain the role of mechanical engineering in industry and society, fundamentals of steam and non-conventional energy sources
CO2	Describe different conventional and advanced machining processes, IC engines, propulsive devices, air-conditioning, refrigeration.
CO3	Explain different gear drives, gear trains, aspects of future mobility and fundamentals of robotics
CO4	Determine the condition of steam and its energy, performance parameters of IC engines, velocity ratio and power transmitted through power transmission systems.
Course Code	**BESCK104D/204D - INTRODUCTION TO MECHANICAL ENGINEERING**

CO1	Explain the concepts of Role of Mechanical Engineering and Energy sources.
CO2	Describe the Machine Tool Operations and advanced Manufacturing process.
CO3	Explain the Working Principle of IC engines and EV vehicles.
CO4	Discuss the Properties of Common Engineering Materials and various Metal Joining Processes.
CO5	Explain the Concepts of Mechatronics, Robotics and Automation in IoT
Course Code	**BETCK105E/205E -RENEWABLE ENERGY SOURCES**
CO1	Describe the environmental aspects of renewable energy resources. In Comparison with various conventional energy systems, their prospects and limitations.
CO2	Describe the use of solar energy and the various components used in the energy production with respect to applications like-heating, cooling, desalination, power generation.
CO3	Understand the conversion principles of wind and tidal energy
CO4	Understand the concept of biomass energy resources and green energy.
CO5	Acquire the basic knowledge of ocean thermal energy conversion and hydrogen energy.
Course Code	**BME302 - MANUFACTRUING PROCESS**
CO1	Describe the casting process and prepare different types of cast products. Acquire knowledge on Pattern, Core, Gating, Riser system and to use Jolt, Squeeze, and Sand Slinger Moulding machines.
CO2	Compare the Gas fired pit, Resistance, Coreless, Electrical and Cupola Metal Furnaces. Compare the Gravity, Pressure die, Centrifugal, Squeeze, slush and Continuous Metal mold castings.
CO3	Understand the Solidification process and Casting of Non-Ferrous Metals.
CO4	Describe the Metal Arc, TIG, MIG, Submerged and Atomic Hydrogen Welding processes etc. used in manufacturing.

CO5	Describe the methods of different joining processes and thermal effects in joining process
Course Code	**BME303 - MATERIAL SCIENCE AND ENGINEERING**
CO1	Understand the atomic arrangement in crystalline materials and describe the periodic arrangement of atoms in terms of unit cell parameters.
CO2	Understand the importance of phase diagrams and the phase transformations.
CO3	Explain various heat treatment methods for controlling the microstructure..
CO4	Correlate between material properties with component design and identify various kinds of defects.
CO5	Apply the method of materials selection, material data and knowledge sources for computer- aided selection of materials.
Course Code	**BME304 - BASIC THERMODYNAMICS**
CO1	Explain fundamentals of thermodynamics and evaluate energy interactions across the boundary of thermodynamic systems.
CO2	Apply 1st law of thermodynamics to closed and open systems and determine quantity of energy transfers.
CO3	Evaluate the feasibility of cyclic and non-cyclic processes using 2nd law of thermodynamics : Apply the knowledge of entropy, reversibility and irreversibility to solve numerical problems and Interpret the behaviour of pure substances and its application in practical problems.
CO4	Recognize differences between ideal and real gases and evaluate thermodynamic properties of ideal and real gas mixtures using various relations.
Course Code	**BMEL305 - Introduction to Modelling and Design for Manufacturing**
CO1	Demonstrate their visualization skills.
CO2	Apply limits and tolerances to assemblies and choose appropriate fits for given assemblies. Make component drawings.

CO3	Produce the assembly drawings using part drawings.
CO4	Engage in lifelong learning using sketching and drawing as communication tool.
Course Code	**BME306A - Electric and Hybrid Vehicle Technology**
CO1	Understand the architecture and vehicle dynamics of electric and hybrid vehicles
CO2	Analyze the power management systems for electric and hybrid vehicles
CO3	Understand different motor control strategies for electric and hybrid vehicles
CO4	Analyze various components of electric and hybrid vehicles with environment concern.
CO5	Understand the domain related grid interconnections of electric and hybrid vehicle.
Course Code	**BME306B - Smart Materials & Systems**
CO1	Apply the knowledge for materials characterisation
CO2	Evaluate the materials based on actuation
CO3	Select and justify appropriate materials for specific application
Course Code	**BME306C - INTERNET OF THINGS**
CO1	Explain the definition and usage of the term “Internet of Things” in different contexts
CO2	Understand the key components that make up an IoT system
CO3	Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack
CO4	Apply the knowledge and skills acquired during the course to build and test a complete, working IoT system involving prototyping, programming and data analysis
CO5	Understand where the IoT concept fits within the broader ICT industry and possible future

Course Code	BME306D - WASTE HANDLING & MANAGEMENT
CO1	Identify & segregate the waste
CO2	Formulate the appropriate waste segregation, collection & disposal system
CO3	Generate a report on waste management challenges
CO4	Select a remedial measure for environmental & living being protection
CO5	Exercise the constitution laws as a citizen
Course Code	**BME358A - ADVANCED PYTHON PROGRAMMING**
CO1	Develop algorithmic solutions to simple computational problems
CO2	Develop and execute simple Python programs
CO3	Use functions to decompose a Python program
CO4	Process compound data using Python data structures
CO5	Utilize Python packages in developing software applications
Course Code	**BME358B - INTRODUCTION TO VIRTUAL REALITY**
CO1	Describe how VR systems work and list the applications of VR.
CO2	Demonstrate the design and implementation of the hardware that enables VR systems to be built.
CO3	Understand the system of human vision and its implication on perception and rendering.
CO4	Explain the concepts of motion and tracking in VR systems.
CO5	Describe the importance of interaction and audio in VR systems.
Course Code	**BME358C - SPREADSHEET FOR ENGINEERS**
CO1	Create different plots and charts

CO2	Compute different functions, conditional functions and make regression analysis
CO3	Carryout iterative solutions for roots, multiple roots, optimization and non-linear regression analysis
CO4	Carryout matrix operations
Course Code	**BME358D - Tools in Scientific Computing**
CO1	Understand the fundamentals of programming in scientific computations.
CO2	Develop programming for curve fitting and solving both linear and nonlinear equations.
CO3	Apply the concept of approximate methods and recognize their significance in computing.
CO4	Apply MATLAB/MATHCAD/FORTRAN/PYTHON tools, etc., for solving engineering problems
Course Code	**BME401 - APPLIED THERMODYNAMICS**
CO1	Analyse air standard cycle to evaluate the performance of I C engines.
CO2	Analyze the gas power cycles to evaluate the overall efficiency of gas turbine plant.
CO3	Apply thermodynamic concepts to analyze the performance of vapour power cycles.
CO4	Analyze the vapour compression and vapour absorption systems to improve refrigeration.
CO5	Determination of various parameters of air compressors and steam nozzles.
Course Code	**BME402 - MACHINING SCIENCE & METROLOGY**
CO1	Analyze various cutting parameters in metal cutting.
CO2	Understand the construction of machines & machine tools and compute the machining time of various operations.
CO3	Understand the concept of Temperature in Metal Cutting, forms of wear in metal cutting and Cutting fluids
CO4	Understand the objectives of metrology, methods of measurement, standards of measurement & various measurement parameters. Explain tolerance, limits of size, fits, geometric and position tolerances, gauges and their design

CO5	Understand the working principle of different types of comparators, gauges, angular Measurements
Course Code	**BME403 - FLUID MECHANICS**
CO1	Identify and calculate the key fluid properties used in the analysis of fluid behavior.
CO2	Understand and apply the principles of pressure, buoyancy and floatation
CO3	Apply the knowledge of fluid dynamics while addressing problems of mechanical and chemical engineering.
CO4	Understand the concept of boundary layer in fluid flow and apply dimensional analysis to form dimensionless numbers in terms of input output variables.
CO5	Understand the basic concept of compressible flow and CFD
CO6	Conduct basic experiments of fluid mechanics and understand the experimental uncertainties.
Course Code	**BME404 - MECHANICAL MEASUREMENTS AND METROLOGY LAB**
CO1	To calibrate pressure gauge, thermocouple, LVDT, load cell, micrometer.
CO2	To measure angle using Sine Center/ Sine Bar/ Bevel Protractor, alignment using Autocollimator/ Roller set.
CO3	To demonstrate measurements using Optical Projector/Tool maker microscope, Optical flats.
CO4	To measure cutting tool forces using Lathe/Drill tool dynamometer.
CO5	To measure Screw thread parameters using 2-Wire or 3-Wire method, gear tooth profile using gear tooth vernier/Gear tooth micrometer.
CO6	To measure surface roughness using Tally Surf/ Mechanical Comparator.
Course Code	**BME405A - NON TRADITIONAL MACHINING**
CO1	Describe non-traditional machining process and compare with Traditional machining process. Recognize the need for Non-traditional machining process.
CO2	Describe the constructional features, performance parameters, process characteristics, applications, advantages, and limitations of USM, AJM and WJM.

CO3	Characterize the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages, and limitations.
CO4	Illustrate the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM & PAM
Course Code	**BME405B - ENVIRONMENTAL STUDIES**
CO1	Understand the basic concepts of environmental studies and natural resources.
CO2	Explain about the various eco-systems of nature.
CO3	Discuss different types of environmental pollutions and their control measures.
CO4	Explain the acquired knowledge about the various social aspects related to the environment.
Course Code	**BME405C - MEMS-Micro Electro Mechanical Systems**
CO1	Understand the working of MEMS technology & Miniaturization.
CO2	Explain the Process of Micro fabrication Techniques.
CO3	Explain the principles of system modelling.
CO4	Understand the working principles of Mechanical sensors and actuators.
CO5	Describe the working principles of Micro-Opto-Electro Mechanical Systems
Course Code	**BME405D - ROBOTICS AND AUTOMATION**
CO1	Explain various types of Robotics, automation, robotics motion, sensors and control, machine vision, robotic programming and roles of robots in industry.
CO2	Understand the working methodology of robotics and automation, motion and control, machine vision and programming, application of robots in industry.
CO3	Write the program for robot for various applications.
CO4	Describe the different material handling and Identification technologies used in automation
Course Code	**BME456A - INTRODUCTION TO AI & ML**
CO1	Understand the implementation procedures for the machine learning algorithms

CO2	Design Java/Python programs for various Learning algorithms.
CO3	Apply appropriate data sets to the Machine Learning algorithms
CO4	Identify and apply Machine Learning algorithms to solve real world problems
CO5	Examine working of PDF and word file formats
Course Code	**BME456B - Digital Marketing**
Course Code	**BME456C - INTRODUCTION TO DATA ANALYTICS**
CO1	1. Explain about the management and planning.
CO2	2. Apply the knowledge on planning, organizing, staffing, directing and controlling.
CO3	Describe the requirements towards the small-scale industries and project preparation.
Course Code	**BME456D - Introduction to programming in C++**
CO1	Apply Object Oriented Programming concepts in C++
CO2	Write a C++ program by applying knowledge of mathematics, science, and engineering.
CO3	Function on multi-disciplinary teams.
CO4	Identify, formulate, and solve engineering problems.
Course Code	**BME501 - Industrial Management & Entrepreneurship**
CO1	Apply Object Oriented Programming concepts in C++
CO2	Write a C++ program by applying knowledge of mathematics, science, and engineering.
CO3	Function on multi-disciplinary teams.
CO4	Identify, formulate, and solve engineering problems.
Course Code	**BME502 - TURBOMACHINES**
CO1	Apply the Model studies and thermodynamics analysis of turbo machines.
CO2	Analyse the energy transfers in Turbo machine with degree of reaction and utilisation factor.

CO3	Classify, analyse and understand various type of hydraulic turbine.
CO4	Understand the concept of radial power absorbing machine and the problems involved during its operation
Course Code	**BME503 - Theory of Machines**
CO1	Knowledge of mechanisms and their motion and the inversions of mechanisms
CO2	Analyse the velocity, acceleration of links and joints of mechanisms.
CO3	Analyse the mechanisms for static and dynamic equilibrium.
CO4	Carry out the balancing of rotating and reciprocating masses
CO5	Analyse different types of governors used in real life situation.
CO6	Analyze the free and forced vibration phenomenon
Course Code	**BEM504L- CNC PROGRAMMING AND 3-D PRINTING LAB**
CO1	Explain the knowledge of G-code and M-code for machining operations.
CO2	Perform CNC programming for turning, drilling, milling and threading operation.
CO3	Use 3D printing technology
CO4	Visualize the 3D models using CAD software's
CO5	Analyze the free and forced vibration phenomenon
Course Code	**BME5151A - MECHATRONICS**
CO1	Illustrate various components of Mechatronics systems.
CO2	Assess various control systems used in automation.
CO3	Design and conduct experiments to evaluate the performance of a Mechatronics system or Component with respect to specifications, as well as to analyse and interpret data.
CO4	Apply the principles of Mechatronics design to product design.
CO5	Function effectively as members of multidisciplinary teams.
CO6	Analyze the free and forced vibration phenomenon
Course Code	**BME515B - Automation in Manufacturing**
CO1	Explain the basics of productions, automation system and manufacturing operations. Solve the simple problems on mathematical model.

CO2	:Explain CAPP and MRP system and analyze the AGVS.
CO3	Understand the inspection technologies and shop floor control.
CO4	Explain the modern trends in additive manufacturing and automated factory.
Course Code	**BME516C - Supply Chain Management & Introduction to SAP**
CO1	Describe the framework and scope of supply chain management.
CO2	Build and manage a competitive supply chain using strategies, models, techniques and information technology.
CO3	Plan the demand, inventory and supply and optimize supply chain network.
CO4	Illustrate the emerging trends and impact of IT on Supply chain.
CO5	Apply the basics of SAP material management system
Course Code	**BME515D - Energy Engineering**
CO1	Understand the construction and working of steam generators and their accessories.
CO2	Identify renewable energy sources and their utilization.
CO3	Understand principles of energy conversion from alternate sources including wind, geothermal, ocean, biomass, nuclear, hydel and tidal.
Course Code	**BME601 - HEAT TRANSFER**
CO1	Course outcomes (Course Skill Set):
CO2	At the end of the course, the student will be able to:
CO3	Determine temperature distribution in steady-state heat conduction.
CO4	Analyse the radiation Heat transfer. Analyse the heat transfer through extended surfaces and
CO5	Design of heat exchangers using LMTD, NTU methods and analyse the boiling and condensation.
Course Code	**BME601 - HEAT TRANSFER**
CO1	Course outcomes (Course Skill Set):
CO2	At the end of the course, the student will be able to:
CO3	Determine temperature distribution in steady-state heat conduction.
CO4	Analyse the radiation Heat transfer. Analyse the heat transfer through extended surfaces and
CO5	Design of heat exchangers using LMTD, NTU methods and analyse the boiling and condensation.

Course Code	BME602 - MACHINE DESIGN
CO1	Apply codes and standards in the design of machine elements and select an element based on the Manufacturer's catalogue.
CO2	Analyse the performance and failure modes of mechanical components subjected to combined loading and fatigue loading using the concepts of theories of failure.
CO3	Demonstrate the application of engineering design tools to the design of machine components like shafts, keys, couplings, welded and riveted joints, brakes and clutches
CO4	Design different types of gears and simple gear boxes for relevant applications.
CO5	Apply design concepts of hydrodynamic bearings for different applications using the manufacturers, catalogue.
Course Code	**BME606L - Design lab**
CO1	Course outcomes (Course Skill Set):
CO2	At the end of the course the student will be able to:
CO3	Compute the natural frequency of the free and forced vibration of single degree freedom systems, critical speed of shafts.
CO4	Analyse the governor characteristics.
CO5	Determination of Pressure distribution in Journal bearing
CO6	Determine stresses in disk, beams and plates using photo elastic bench.
CO7	Analyse the stress and strains using strain gauges in compression and bending test
CO8	To realize different mechanisms and cam motions
Course Code	**BME613A - TOTAL QUALITY MANAGEMENT**
CO1	Explain the various approaches of TQM
CO2	Infer the customer perception of quality
CO3	Analyse customer needs and perceptions to design feedback systems.
CO4	Apply statistical tools for continuous improvement of systems
CO5	Apply the tools and technique for effective implementation of TQM.
Course Code	**BME613B - REFRIGERATION AND AIR CONDITIONING**
CO1	Understand the principles, nomenclature and applications of refrigeration systems.
CO2	Explain vapour compression refrigeration system and identify methods for performance improvement
CO3	Illustrate the working principles of air, vapour absorption, thermoelectric and steam-jet and thermoacoustic refrigeration systems.

CO4	Estimate the performance of air-conditioning systems using the principles of psychrometry.
CO5	Compute and Interpret cooling and heating loads in an air-conditioning system.
CO6	Identify suitable refrigerant for various refrigerating systems.
Course Code	**BME613C - MEMS & MICROSYSTEM TECHNOLOGY**
CO1	Demonstrate the working methodology of smart materials, Microsystems, electronic circuitry in MEMS devices.
CO2	Illustrate the process of silicon wafer preparation, thin film deposition techniques, lithography, etching, bulk & surface micromachining involved in MEMS fabrication.
CO3	Examine the behaviour of piezoresistive & piezoelectric materials required to fabricate pressure sensor & vibration control structures.
CO4	Measure the performance of pressure sensor & vibration control structure in real time
Course Code	**BME613D - Design for Manufacturing and Assembly**
CO1	Apply the concepts of Geometrical dimensioning, selection of materials and tolerance for engineering products
CO2	Analyse the design principles related to various manufacturing processes and assembly method
CO3	Develop the appropriate material and machining sequence for manufacturing processes
CO4	Select a suitable manufacturing system considering environmental factors
Course Code	**BME654A - PROJECT MANAGEMENT**
CO1	Understand the selection, prioritization and initiation of individual projects and strategic role of project management.
CO2	Understand the work breakdown structure by integrating it with organization.
CO3	Understand the scheduling and uncertainty in projects.
CO4	Understand risk management planning using project quality tools.
CO5	: Understand the activities like purchasing, acquisitions, contracting, partnering and elaborations related to performing projects.
CO6	Determine project progress and results through balanced scorecard approach
CO7	Draw the network diagram to calculate the duration of the project and reduce it using
Course Code	**BME654B - Renewable Energy Power Plants**
CO1	Understand the need of renewable energy resources, historical and latest developments.
CO2	Describe the use of solar energy and the various components used in the energy production
CO3	Appreciate the need of Wind Energy and the various components used in energy generation and
CO4	Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and Applications.

CO5	Understand the concept of Biomass energy resources and their classification, types of biogas
Course Code	**BME654C - MECHATRONICS**
CO1	Illustrate various components of Mechatronics systems.
CO2	Assess various control systems used in automation.
CO3	Design and conduct experiments to evaluate the performance of a Mechatronics system or Component with respect to specifications, as well as to analyse and interpret data.
CO4	Apply the principles of Mechatronics design to product design.
CO5	Function effectively as members of multidisciplinary teams.
Course Code	**BME654D - MODERN MOBILITY**
CO1	Understand the working of different systems employed in automobile
CO2	Evaluate the energy sources suitability
CO3	Apply the knowledge for selection of automobiles based on their suitability
CO4	Analyse the limitation of present-day automobiles
Course Code	**BME657A - Basics of Matlab**
CO1	Implement loops, branching, control instruction and functions in MATLAB programming environment.
CO2	Programming for curve fitting, numerical differentiation and integration, solution of linear equations in MATLAB and solve engineering problems.
CO3	Understand implementation of ODE using ode 45 and execute Solutions of nonlinear equations and DFT in MATLAB.
CO4	Simulate MATLAB Simulink examples.
Course Code	**BME657B - Fundamental of Virtual Reality ARP Development**
CO1	Describe how VR systems work and list the applications of VR.
CO2	Understand the design and implementation of the hardware that enables VR systems to be built.
CO3	Understand the system of human vision and its implication on perception and rendering. CO4: Explain the concepts of motion and tracking in VR systems.
CO4	Describe the importance of interaction and audio in VR systems.
Course Code	**BME657C - Simulation and Analysis using Ansys workbench**
CO1	Covers fundamentals and practical knowledge of finite element modelling and simulation

CO2	Uses ANSYS Workbench as the FEA environment Describes simulation case studies demonstrated in a step-by-step fashion Includes a web-based geometry input CAD files for ANSYS Workbench examples Covers the analyses of trusses, beams, frames, plane stress and plane strain problems, plates and shells, three-dimensional design components, and assembly structures
CO3	APPLY basics of Theory of Elasticity to continuum problems.
CO4	FORMULATE finite elements like bar, truss and beam elements for linear static structural analysis. FORMULATE 2D and axisymmetric finite elements.
CO5	Develop finite element equations for 1D heat transfer elements and solve numericals.
CO6	Apply finite element simulation tool to solve practical problems (Lab and Self-study).
Course Code	**BME657D- Introduction Augmented Reality**
CO1	Describe how AR systems work and list the applications of AR.
CO2	Understand and analyse the hardware requirement of AR.
CO3	Apply computer vision concepts for AR and describe AR techniques
CO4	Analyse and understand the working of various state of the art AR devices
CO5	Explain the knowledge acquired on mixed reality
Course Code	**BME657D- Introduction Augmented Reality**
CO1	Describe how AR systems work and list the applications of AR.
CO2	Understand and analyse the hardware requirement of AR.
CO3	Apply computer vision concepts for AR and describe AR techniques
CO4	Analyse and understand the working of various state of the art AR devices
CO5	Explain the knowledge acquired on mixed reality
Course Code	**BME701 - FINITE ELEMENT METHODS**
CO1	Understand the concepts behind formulation methods in FEM.
CO2	Identify the application and characteristics of FEM elements such as bars, beams, plane and iso- parametric elements.
CO3	Develop element characteristic equation and generation of global equation.
CO4	Apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi symmetric and dynamic problems.
CO5	Solving of displacements, stress and strains induced problems.
Course Code	**BME702 - Hydraulics & Pneumatics**

CO1	Identify and analyse the functional requirements of a fluid power transmission system for a given application.
CO2	Understand the operation, application, and maintenance of common fluid power components such as pumps, actuators and accumulators.
CO3	Design an appropriate hydraulic or pneumatic circuit or combination circuit like electro- hydraulics, electro- pneumatics for a given application.
CO4	Explain the pneumatic working media, applications and components of pneumatic system.
CO5	Develop a comprehensive circuit diagram by integrating the components selected for the
Course Code	**BME703 - CONTROL ENGINEERING**
CO1	Explain the control system and its types, control actions and develop system governing equations for physical models (Mechanical, Electrical, Thermal &Hydraulic Systems)
CO2	Analysis on the response of control system for standard test signals.
CO3	Apply block diagram & signal flow representations to obtain transfer function of control systems.
CO4	Analyse the stability of transfer functions in complex domain and frequency domain.
Course Code	**BME714A - Additive manufacturing**
CO1	Demonstrate the knowledge of the broad range of AM processes, devices, capabilities and materials that are available.
CO2	Demonstrate the knowledge of the broad range of AM processes, devices, capabilities and materials that are available.
CO3	Describe the various software tools, processes and techniques that enable advanced/additive manufacturing.
CO4	Apply the concepts of additive manufacturing to design and create components that satisfy product development/prototyping requirements, using advanced/additive manufacturing devices and processes.
CO5	Elucidate characterization techniques in additive manufacturing.
CO6	Illustrate the latest trends and business opportunities in additive manufacturing.
Course Code	**BME714B - Product Design and Management**
CO1	Illustrate the concept of product design and the ergonomics.
CO2	Design the various controls and displays by knowing the anthropometric data.
CO3	Charaterize the psychology of visuals effects.
CO4	Evaluate the different colour combinations for optimal design of engineering equipments.
CO5	Understand the importance of environmental factors and aesthetics in industrial design and management.
Course Code	**BME714C-IC ENGINES**

CO1	Understand various types of I.C. Engines, Cycles of operation and Identify fuel metering, fuel supply systems for different types of engines.
CO2	Explain the operating characteristics and thermodynamic analysis of common internal combustion engine cycles.
CO3	Understand combustion phenomena in SI and CI engines and Analyze the effect of various operating variables on engine performance.
CO4	To analyze the combustion process of common fuels.
CO5	Understand the conventional and non-conventional fuels and effects of emission formation of IC engines, its effects and the legislation standards.
Course Code	**BME714D- Cryogenics**
CO1	Understand the cryogenic system.
CO2	Demonstrate the complete knowledge of cryogenic refrigeration system
CO3	Design gas separation and gas purification systems
CO4	Solve the problem in , insulation, storage of cryogenic liquids
CO5	Apply cryogenic in various areas and to be able take up research in cryogenics
Course Code	**BME755A- NON-TRADITIONAL MACHINING**
CO1	CO1: Understand the compare traditional and non-traditional machining process and recognize the need for Non- traditional machining process.
CO2	CO2: Explain the constructional features, performance parameters, process characteristics, applications, advantages and limitations of USM, AJM and WJM.
CO3	CO3: Identify the need of Chemical and electro-chemical machining process along with the constructional features, process parameters, process characteristics, applications, advantages and limitations.
CO4	CO4: Understand the constructional feature of the equipment, process parameters, process characteristics, applications, advantages and limitations EDM & PAM.
CO5	CO5: Understand the LBM equipment, LBM parameters, and characteristics. EBM equipment and mechanism of metal removal, applications, advantages and limitations LBM & EBM.
Course Code	**BME755B- BASICS OF HYDRAULIC & PNEUMATICS**
CO1	Identify and analyse the functional requirements of a fluid power transmission system for a given application.
CO2	Understand the operation, application, and maintenance of common fluid power components such as pumps, actuators and accumulators.
CO3	Design an appropriate hydraulic or pneumatic circuit or combination circuit like electro- hydraulics, electro- pneumatics for a given application.
CO4	understand the pneumatic working media, applications and components of pneumatic system.
CO5	Develop a comprehensive circuit diagram by integrating the components selected for the given
Course Code	**BME755C- OPERATIONS RESEARCH**

CO1	**Understand the importance,phase & limitations of operation research**
CO2	Formulate a real-world problem in OR as a mathematical model.
CO3	Apply PERT and CPM network techniques to solve project management problems.
CO4	Choose appropriate OR models to solve transportation problem, assignment model, game theory, queuing theory and sequencing models.
Course Code	**BME755D- NON-CONVENTIONAL ENERY RESOURCES**
CO1	Describe the environmental aspects of non-conventional energy resources in Comparison with various conventional energy systems, their prospects and limitations, the need of renewable energy resources, historical and latest developments.
CO2	Describe the use of solar energy and the various components used in the energy production with respect to applications like-heating, cooling, desalination, power generation, drying, cooking etc.
CO3	Explain the need of Wind Energy and the various components used in energy generation and know the classifications.
CO4	Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications.
CO5	Compare the working principles of fuel cells, wave power, tidal power and geothermal principles and applications.
Course Code	**BME801A Quality Design & Control (Available in NPTEL)**
Course Code	**BME801B Machinery Fault Diagnosis and Signal Processing (Available in NPTEL)**
Course Code	**BME803 Internship (Industry/Research) (14 - 20 weeks)**
Course Code	**BME801C Modelling & Analytics for Supply Chain Management (Available in NTPL)**
Course Code	**BME801D Strategies for Sustainable Design (Available in NPTEL)**
Course Code	**BME802A Fundamentals of Automotive systems (Available in NPTEL)**
Course Code	**BME802B Product Design and Manufacturing (Available in NPTEL)**
Course Code	**BME802C Computer Integrated Manufacturing (Available in NPTEL)**
Course Code	**BME802D Business Planning & Project Management (Available in Swayam Portal)**