BACHELOR OF TECHNOLOGY
MECHANICAL ENGINEERING
THIRD YEAR (SIXTH SEMESTER)

W.E.F. ADMISSION BATCH 2023-24

Sl. No.	Category	Course Code	Course	Contact Hrs. L-T-P	Credit	University Marks	Internal Evaluation
Subject (Theory)							
1	PC	MEPC3004	IC Engines & Gas Turbines	3-0-0	3	100	50
2	PC	MEPC3005	Mechanical Vibration	3-0-0	3	100	50
3	PE	MEPE3006	Power Plant Engineering	3-0-0	3	100	50
		MMPE3007	Mechatronics				
		MMPE3008	Robotics				
		MFPC3005	Computer Aided Design and Manufacturing (CAD / CAM)				
		MEPE3010	Product Design & Production Tooling				
		–	–				
		–	–				
4	PE	MFPE3011	Additive Manufacturing	3-0-0	3	100	50
		MEPE3012	Finite Element Analysis				
		MEPE3013	Non-Conventional Energy Systems				
		MEPE3014	Automobile Engineering				
		MEPE3015	Design Concepts In Engineering				
		–	–				
		–	–				
5	HS	HSHS3002	Entrepreneurship Development	3-0-0	2	100	50
		HSHS3001	Business Management				
6	MC	MCMC3002	Industrial Safety Engineering	3-0-0	2	100	50
		MCMC3001	Environmental Engineering				
Subject (Sessional / Practical)							
7	PSI	CSPS3202	Project for Product Development - I	0-0-6	3	–	100
8	PC	MEPC3204	IC Engines & Heat Transfer Laboratory	0-0-3	1.5	–	100
9	PC	MEPC3205	Mechanical Vibration Laboratory	0-0-3	1.5	–	100
			Total	**18-0-12**	**22**	**600**	**600**

NB : Minimum 4 weeks of Summer Internship and Research Experience-II (SIRE-II) after 6th Semester during the vacation.

Click here to view/download the syllabus of the subjects.

MEPC3004 IC ENGINES AND GAS TURBINES (3-0-0)

Course Objectives

The course aims to:

- Provide fundamental and advanced understanding of spark-ignition (SI) and compression-ignition (CI) engines.
- Develop knowledge of fuel–air cycles, combustion processes, and engine performance characteristics.
- Introduce gas turbine theory, components, cycles, and applications.
- Familiarize students with modern developments like turbo charging, fuel injection systems, and low-emission technologies.
- Equip students for automotive, power plant, and aerospace applications.

MODULE – I: Introduction to IC Engines (10 Hrs)

Classification and applications of IC engines, Four-stroke and two-stroke SI & CI engines, Engine components and their functions, Fuel–air cycles, actual cycles, comparison with air-standard cycles, Valve timing & port timing diagrams, Engine performance parameters: IP, BP, FP, BSFC, indicated efficiency, brake efficiency, mechanical efficiency

MODULE – II: Combustion in IC Engines (10 Hrs)

SI Engines: Combustion stages, Flame speed, Ignition lag, Abnormal combustion: detonation, preignition, Factors affecting detonation and control

CI Engines: Combustion stages, Delay period, Diesel knock—causes and control, Fuel spray formation and atomization, Combustion chambers for SI and CI engines

MODULE – III: Engine Systems & Modern Technologies (10 Hrs)

Carburetion and fuel-injection systems, Electronic fuel injection (EFI), Common-rail direct injection (CRDI), Supercharging & Turbocharging: systems, spark plugs, glow plugs, Governing of IC engines, Emission formation (NOx, CO, HC, PM), Emission control technologies: catalytic converters, EGR, DPF, SCR

MODULE – IV: Introduction to Gas Turbines (08 hrs)

Classification of gas turbines, Open cycle & closed cycle gas turbines, Brayton cycle–ideal & actual, Regeneration, intercooling, reheating, Gas turbine fuels, materials, blade cooling

Performance analysis and efficiency improvements

MODULE – V: Gas Turbine Components & Applications (08 Hrs)

Compressors: axial & centrifugal—principles, characteristics, Combustion chambers: types, design considerations, Turbines: impulse and reaction, Nozzle and diffuser principles, Gas turbine power plants, Applications in power generation, marine systems, and aerospace propulsion

Course Outcomes (COs)

After completing the course, students will be able to:

1. Explain the working principles and classifications of IC engines and gas turbines.
2. Analyze combustion processes, fuel systems, and engine operation parameters.
3. Evaluate performance metrics such as power, efficiency, and fuel consumption.
4. Understand gas turbine cycles and component design principles.
5. Identify emission control strategies and modern technological advancements.
6. Apply thermodynamic and fluid-flow principles to engine and turbine performance.

Text Books

1. V. Ganesan – Internal Combustion Engines
2. Heywood – Internal Combustion Engine Fundamentals
3. Cohen, Rogers & Saravanamuttoo – Gas Turbine Theory
4. Mathur & Sharma – IC Engines
5. H.I.H. Saravanamuttoo – Gas Turbines

Reference Books

1. Ferguson & Kirkpatrick – Internal Combustion Engines
2. Hill & Peterson – Mechanics and Thermodynamics of Propulsion
3. Boyce – Gas Turbine Engineering

MEPC3005 MECHANICAL VIBRATION (3-0-0)

Course Objectives

The objectives of this course are to:

1. Introduce fundamental concepts of vibration and its significance in mechanical systems.
2. Enable the formulation of mathematical models for free, damped, and forced vibrations in single and multi-degree freedom systems.
3. Develop analytical skills to solve vibration problems using various methods like matrix iteration and classical techniques.
4. Explore the behavior of continuous systems subjected to different types of vibrations.
5. Introduce students to practical aspects of vibration control and measurement, including applications in mechanical design.

Module - I: (05 Hours)

INTRODUCTION TO VIBRATION AND EQUATIONS OF MOTIONS: NATURAL FREQUENCY

Undamped Free Vibration: Systems with single degree of freedom, Equilibrium method, The energy method, Rayleigh's method, Stiffness of spring elements.

Module - II: (07 Hours)

VISCOUSLY DAMPED FREE VIBRATION

Damped Free Vibrations: Viscous damping, laws of damping, logarithmic decrement.

Module - III: (08 Hours)

FORCED HARMONIC VIBRATION

Forced Vibration with Harmonic Excitation: Steady state solution with viscous damping, Method of complex algebra, Reciprocating and rotating unbalance, Base excitation, Vibration isolation, Air springs, Energy dissipated by damping, Equivalent viscous damping, Structural damping, Sharpness of resonance, Vibration measuring instruments, Whirling of rotating shafts, Rigid shafts supported by flexible bearings.

Module - IV: (08 Hours)

VIBRATION OF MULTI DEGREE FREEDOM SYSTEMS

Two degree of freedom system: Vibration of undamped two degree of freedom system, coordinate coupling, vibration absorber. Multi-degree freedom system: Influence coefficients, generalized co-ordinates, matrix method, matrix iteration method, Stodola Method, Holzer's Method, Dunkerley's method.

Module - V: (08 Hours)

VIBRATION OF CONTINUOUS SYSTEMS

Vibration of Continuous systems, Vibration of String, Longitudinal Vibration of Rods, Torsional Vibration of Rods, Vibration of Beams.

Course Outcomes

CO1 Define and explain key concepts in vibration theory including natural frequency, damping, and vibration models for mechanical systems.

CO2 Formulate and solve equations of motion for undamped and damped single-degree-of-freedom systems using energy methods and Rayleigh's method.

CO3 Analyze forced vibration systems with harmonic excitation and evaluate the effects of damping, resonance, and vibration isolation systems.
CO4 Model and determine the natural frequencies and mode shapes of multi-degree-of-freedom systems using matrix-based methods.
CO5 Analyze the vibrational behavior of continuous systems such as strings, rods, and beams, and assess their dynamic response.

Essential Reading

1. W.T. Thompson, Theory of Vibration with Application, Kindle Edition-2025, Pearson Education , 2025
2. Tony L. Schmitz (Author), K. Scott Smith (Author), Mechanical Vibrations: Modeling and Measurement, Kindle Edition 2025, Springer , 2025

Supplementary Reading

1. Leonard Meirovitch, Elements of Vibration Analysis, MC GRAWHILL , 2019
2. Haym Benaroya (Author), Mark Nagurka (Author), Mechanical Vibration: Theory and Application, Kindle Edition: 2025, Rutgers University Press , 2025

MEPE3006 POWER PLANT ENGINEERING (3-0-0)

Course Objectives

The objectives of this course are to:

- Provide fundamental knowledge of various power generation methods and thermodynamic cycles.
- Explain the working principles, construction, and performance of essential components of modern thermal power plants.
- Discuss the design and operational aspects of different types of power plants including steam, nuclear, hydroelectric, and diesel.
- Enable students to analyze the efficiency and performance of steam turbines, nozzles, condensers, and cooling systems.
- Develop awareness of modern trends in combined cycle systems, environmental impacts, and energy sustainability.

Module - I (04 Hours)

Vapor Power cycle: Carnot cycle, Rankine cycle, Reheat cycle, Regenerative cycles, Combined cycle.

Module - II (06 Hours)

Steam Generators: Types of Steam Generators, Fire-tube Boilers, Water-Tube Boilers, Pulverised Coal Burners, Principle of Fluidised Bed Combustion (FBC) System, Combined Cycle power plant: Coal based combined plant, Integrated gasification (IGCC), Performance of Boilers.

Module - III (06 Hours)

Nozzle: Types of nozzles, Flow of steam through nozzles, Supersaturated or metastable expansion of steam in a nozzle.

Module - IV (06 Hours)

Steam Turbine: Classification of steam turbines, Impulse turbine, reaction turbine, Turbine efficiencies, Energy losses in steam turbines, Steam turbine governing and control.

Module - V (06 Hours)

Condensers: Classification of condensers, Jet condenser, surface condenser, Air leakage, Vacuum efficiency, Condenser efficiency, Circulating Water System, Cooling Towers, Cooling Tower Calculations.

Module - VI (10 Hours)

Diesel Power Plants: General layout, Components of Diesel engine power plant, Application of diesel engines in power field, Advantages and disadvantages, Performance characteristics, Nuclear Power Plant: Release of nuclear energy, Criticality of reactors, Thermal reactors, nuclear fuels, Moderator, Reflector, Coolant and control of reactors, BWR, PWR and gas cooled reactors. Hydroelectric Power Plant: Hydrological Cycle, Hydraulic Turbines.

Course Outcomes:

CO1 Explain the working principles of vapor power cycles including Rankine, Reheat, Regenerative, and Combined Cycles.

CO2 Describe the construction and operating principles of steam generators, nozzles, turbines, and condensers used in thermal power plants.

CO3 Analyze the performance and efficiency of steam turbines, condensers, and cooling towers, using relevant thermodynamic relations.

CO4 Illustrate the working, layout, and components of diesel, hydroelectric, and nuclear power plants, and evaluate their advantages and limitations.
CO5 Compare different power generation systems in terms of operating principles, applications, environmental impact, and efficiency.

Essential Reading

1. P.K Nag, Power Plant Engineering, McGraw Hill, 5th Edition, 2021
2. S.C Arora, A V Domkundwar, Power Plant Engineering, Dhanpat Rai Publication, 6/E 2024

Supplementary Reading

1. Dipak Kumar Mandal, Somnath Chakrabarti, Arup Kumar Das, Prasanta Kumar Das, Power Plant Engineering: Theory and Practice, Wiley, 1st Edition 2019
2. R. Yadav, Rajay, Sanjay, Fundamentals of Power Plant Engineering, IK International Pvt. Ltd, 2nd Edition 2022

MMPE3007 MECHATRONICS (3-0-0)

Module - I: [06 Hours]
Introduction: Introduction to Mechatronics: Mechatronic system, measurement systems, Introduction to Mechanical, Electrical, Fluid and Thermal systems, Rotational and Transnational systems, Electro-Mechanical, Hydraulic-Mechanical systems.

Module - II: [06 Hours]
Sensors: Desirable features, Displacement, position and proximity sensors, Velocity, motion and Force sensors, Time of flight sensors, Binary force sensor, temperature and Pressure measurement, Sensor selection.

Module - III: [06 Hours]
Actuation Systems: Actuation Systems, Pneumatic and Hydraulic systems, Directional control valves, Rotary actuator, Mechanical actuation systems- Mechanical Systems, Electrical Actuation Systems- Electrical Systems, Relays and Solenoids, DC brushed motors, DC brushless motors, DC servo motors, Stepper Motors. Drive selection.

Module - IV: [06 Hours]
Microcontrollers: 8051 Microcontroller, Microprocessor structure, Digital Interfacing, Analog Interfacing, Applications Programming- Assembly/ C (LED Blinking, Controlling a stepper motor).

Module - V: [06 Hours]
Interfacing: Interfacing microcontrollers with general purpose three-state transistors, interfacing relays, Interfacing solenoids, Interfacing stepper motor, Interfacing with sensors, Interfacing with RS 232 and RS485.

COURSE OUTCOMES: At the end of this course, students will demonstrate the ability to
1. Analyze the mechatronics system design and characteristics of sensors and actuators.
2. Define the applications of Sensors.
3. Recognize the applications of Actuation systems.
4. Design 8051 Microcontroller and Programmable Logic Controllers.
5. Analyze the Mechatronics systems by interfacing transistors, sensors, and motors.

Text Book(S):
1. Mechatronics- W Bolton, Pearson Education.
2. MEMS and Microsystems Design and Manufacture- Tai, Ran Hsu, TMH.

Reference Book(S):
1. Mechatronics Principles and Applications- G.C.Onwubolu, Butterworth-Heinemann
2. Foundations of MEMS- Chang Liu, Pearson International Edition.
3. Fundamentals of Microfabrication- Madou, CRC Press.

MMPE3008 ROBOTICS (3-0-0)

Course Objectives:

- Introduce the fundamentals and evolution of robotics, including robot components and classifications.
- Develop understanding of the mathematical, kinematic, and dynamic modeling of robotic manipulators.
- Build knowledge in robotic motion planning, trajectory generation, and control strategies.
- Explore various sensors, actuators, and their roles in perception and control in robotic systems.
- Familiarize students with industrial applications of robots and integration in automation systems.

Module – I (9 Hours)

Fundamentals of Robotics: Evolution of robots and robotics, Definition of industrial robot, Laws of Robotics, Classification, Robot Anatomy, Work volume and work envelope, Human arm characteristics, Design and control issues, Manipulation and control, Resolution; accuracy and repeatability, Robot configuration, Economic and social issues, Present and future application.

Module – II (9 Hours)

Mathematical modelling of a robot: Mapping between frames, Description of objects in space, Transformation of vectors. Direct Kinematic model: Mechanical Structure and notations, Description of links and joints, Kinematic modelling of the manipulator, Denavit-Hartenberg Notation, Kinematic relationship between adjacent links, Manipulator Transformation matrix.

Module – III (9 Hours)

Inverse Kinematics: Manipulator workspace, Solvable of inverse kinematic model, Manipulator Jacobian, Jacobian inverse, Jacobian singularity, Static analysis. Dynamic modeling: Lagrangian mechanics, 2D-Dynamic model, Lagrange-Euler formulation, Newton-Euler formulation. Robot Sensors: Internal and external sensors, force sensors, Thermocouples, Performance characteristic of a robot.

Module – IV (9 Hours)

Robot Actuators: Hydraulic and pneumatic actuators, Electrical actuators, Brushless permanent magnet DC motor, Servomotor, Stepper motor, Micro actuator, Micro gripper, Micro motor, Drive selection. Trajectory Planning: Definition and planning tasks, Joint space planning, Cartesian space planning. Applications of Robotics: Capabilities of robots, Material handling, Machine loading and unloading, Robot assembly, Inspection, Welding, Obstacle avoidance.

Course Outcomes:

CO1 Describe the basic concepts of robotics including evolution, classification, laws of robotics, robot anatomy, and applications.

CO2 Develop kinematic models of robotic manipulators using coordinate transformations and Denavit-Hartenberg notation.

CO3 Solve inverse kinematics problems and analyze manipulator Jacobians, workspaces, and singularities.

CO4 Formulate dynamic models of manipulators using Lagrangian and Newton-Euler methods.

CO5 Identify different types of sensors and actuators used in robotics and explain their roles in control and feedback.

CO6 Plan robot trajectories and demonstrate the industrial applications of robots in areas like material handling, assembly, and welding.

Text Books:

1. Robotics Technology and Flexible Automation, S.R.Deb and S. Deb, TMH.
2. Robotics and Control, R.K. Mittal and I.J. Nagrath, Tata McGraw Hill.
3. Introduction to Robotics: Mechanics and control, John J Craig, PHI.

Reference Books:

1. Introduction to Robotics, S. K. Saha, Tata McGraw Hill.
2. Robotics: Control, Sensing, Vision and Intelligence, K.S.Fu, R.C.Gonzalez and C.S.G.Lee, McGraw Hill.
3. Robotics, Appuu Kuttan K.K., I.K. international.
4. Robot Dynamics and Control, M.W.Spong and M. Vidyasagar, Wiley India.
5. Industrial Robotics Technology, programming and application, M.P.Groover, TMH.
6. Introduction to Robotics: Analysis, Systems, Applications, S.B.Niku, PHI.
7. Robotics: Fundamental Concepts and Analysis, A. Ghosal, Oxford University Press.
8. Fundamentals of Robotics: Analysis and Control, R. J. Schilling, PHI.
9. Robotic Engineering: An Integrated Approach, R.D. KLAFTER, T. A. Chmielewski, and M. Negin, PHI.
10. Robot Technology: Fundamentals: J. G. Keramas, Cengage Learning.

MFPC3005 COMPUTER AIDED DESIGN AND MANUFACTURING (CAD / CAM) (3-0-0)

Module - I: (08 Hours)
Fundamentals of CAD: The design process, applications of computer for design, creating the Manufacturing, Database, The design workstation, Graphical Terminal, Operator input Devices, Plotters and other devices, the CPU secondary storage.

Module – II: (08 Hours)
Computer graphics Software and Database: Configuration, Graphics Packages, Constructing the Geometry, transformations, Database structure and content, wire frame versus solid modeling.

Module – III: (08 Hours)
CAM – Introduction, Numerical Control and NC Part Programming: NC Coordinate system, NC motion control system, Economics of NC, Manual and Computer Aid Programming, the APT language, NC programming with interactive graphics.

Module – IV: (08 Hours)
Problems with conventional NC, NC technology: CNC, DNC combined DNC/CNC system, Adopter control manufacturing systems.

Module – V: (08 Hours)
Computer Integrated manufacturing system, Machine Tools and related Equipment, Materials Handling and Storage system, computer system.

Text Book(s):

1. Computer Aided design and Manufacture, Grover M.P.Simmers, E.W. Prentice Hall
2. CAD/CAM/CIM, P.Radhakrishnan&Subramanyam, Willey Eastern Limited.
3. Principles of Computer Aided Design and Manufacturing / FaridAmirouche / Pearson.

MEPE3010 PRODUCT DESIGN & PRODUCTION TOOLING (3-0-0)

Course Objectives

The objectives of this course are to:

- Provide an understanding of the fundamentals of product design, including design considerations, development, and value analysis.
- Familiarize students with various stages of process planning, including sequence design, machine/tool selection, and cost estimation.
- Develop competency in the design of dies for forging and sheet metal operations.
- Introduce the principles and practices of designing jigs, fixtures, and cutting tools.
- Enable students to apply design principles in real-world production tooling, enhancing both productivity and manufacturability.

Module - I: (12 Hours)

Product Design-Product design considerations, product planning, product development, value analysis, product specification. Role of computer in product design. Process Planning – selection of processes, machines and tools. Design of sequence of operations, Time & cost estimation.

Module - II: (12 Hours)

Forging design- allowances, die design for drop forging, design of flash and gutter, upset forging die design. Sheet metal working- Design consideration for shearing, blanking piercing, deep drawing operation, Die design for sheet metal operations, progressive and compound die, strippers, stops, strip layout.

Module - III: (12 Hours)

Design of jigs and fixtures, principle of location and clamping, clamping methods, locating methods, Drill Jig bushing, Indexing type drilling Jig. Design of single point cutting tool, broach and form tool. Tooling design for turret lathe. Design of limit gauges.

Course Outcomes:

CO1 Explain the stages of product design and process planning, including product development, value analysis, and cost estimation.

CO2 Select appropriate manufacturing processes, machines, and tools by considering production constraints and specifications.

CO3 Design forging and sheet metal working dies by applying suitable allowances, layout methods, and tool configurations.

CO4 Develop appropriate jigs and fixtures by applying location and clamping principles for accurate and efficient machining operations.

CO5 Design various cutting tools (single point, broach, form tools) and limit gauges for specific production needs.

Books:

1. Product Design & Manufacturing, A K Chitale, R C Gupta, Eastern Economy Edition, PHI.
2. Product Design & Development, Karl T Ulrich, Steven D Eppinger, Anita Goyal, Mc- Graw Hill.
3. A Textbook of Production Engineering, P.C. Sharma, S. Chand & Co
4. Fundamentals of Tool Engineering design, S.K. Basu, S.N. Mukherjee, R. Mishra, Oxford &IBH Publishing Co.
5. Technology of Machine Tools, Krar, Gill, Smid, Tata Mc Graw Hill
6. Jigs & Fixture Design, Edwrd G Hoffman, Cengae Learning.

MFPE3011 ADDITIVE MANUFACTURING (3-0-0)

Course Objective:

The course aims to provide students to: Understand and explain the fundamentals, historical development, and advantages of additive manufacturing technologies (AMTs), including key processes, terms, and applications across various fields, analyze and differentiate between liquid-based, solid-based, and powder-based AMT systems, including their models, specifications, working principles, applications, and case studies and apply knowledge of additive manufacturing processes to assess and evaluate their advantages, disadvantages, and practical implications through real-world examples and demonstrations.

Syllabus

Module-I: (10 Hours)

Introduction, Prototyping fundamentals, Historical development, Advantages of AMT, Commonly used terms, process chain, 3D modelling, Data Conversion, and transmission, Checking and preparing, Building, Post processing, RP data formats, Classification of AMT process, Applications to various fields

Module-II: (10 Hours)

Liquid based systems: Stereo lithography apparatus (SLA): Models and specifications, process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, applications, advantages and disadvantages, case studies. Solid ground curing (SGC): Models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

Module-III: (10Hours)

Solid based systems: Laminated object manufacturing (LOM): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies. Fused Deposition Modeling (FDM): Models and specifications, Process, Working principle, Applications, Advantages and disadvantages, Case studies, practical demonstration

Module-IV: (10 Hours)

Powder Based Systems: Selective laser sintering (SLS): Models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Three dimensional printing (3DP): Models and specification, process, working principle, applications, advantages and disadvantages, case studies.

Course outcomes:

After the completion of this course, students will be able to:

CO1: Understanding and remembering - Define and describe the fundamental concepts, commonly used terms, and historical development of additive manufacturing technologies (AMTs).

CO2: Comprehension - Explain the process chains, data formats, and the applications of AMTs in various fields

CO3: Application - Apply the principles of additive manufacturing

CO4: Analysis - Differentiate between the various additive manufacturing processes.

CO5: Evaluation - Critically assess the effectiveness and practical implications of different AMTs.

Books:

1. Chua C.K., Leong K.F. and LIM C.S Rapid prototyping: Principles an Applications, World Scientific publications, 3rdEd., 2010
2. D.T. Pham and S.S. Dimov, “Rapid Manufacturing”, Springer, 200
3. Terry Wohlers, “ Wholers Report 2000”, Wohlers Associates, 2000
4. Paul F. Jacobs, “ Rapid Prototyping and Manufacturing”–, ASME Press, 1996
5. Ian Gibson, Davin Rosen, Brent Stucker “Additive Manufacturing Technologies, Springer, 2nd Ed, 2014.

MEPE3012 FINITE ELEMENT ANALYSIS (3-0-0)

Course Objectives

The main objectives of this course are to:

1. Introduce students to the fundamentals and general procedure of the Finite Element Method (FEM) for solving engineering problems.
2. Provide a deep understanding of 1D and 2D finite element formulations using energy and Galerkin approaches.
3. Enable students to model and analyze structural problems in trusses, beams, frames, and axisymmetric solids.
4. Familiarize students with isoparametric elements, numerical integration, and convergence techniques.
5. Develop the ability to apply FEM for analyzing real-world elasticity, structural, and thermal problems.

Module - I: Fundamental Concepts (09 Hours)

Introduction, Historical background, Outline of presentation, General procedure for FEA, Stresses and Equilibrium, Boundary conditions, Strain Displacement relations, Stress-Strain relations, Plane stress, Plane strain problems, Temperature effects, Potential energy and equilibrium. The Rayleigh-Ritz method, Hamilton's principle. Galerkin's method, Saint Venant's principle.

Module - II: One-dimensional Problems (09 Hours)

Introduction, Finite element modeling, Coordinates and Shape functions. The potential energy approach. The Galerkin approach, Assembly of the global stiffness matrix- mass matrix and load vector, Treatment of boundary conditions, Quadratic shape functions, Temperature effects. Trusses: Introduction, Plane trusses, Three-dimensional trusses, Assembly of global stiffness matrix for the Banded and Skyline solutions.

Module - III: Two-dimensional Problems Using Constant Strain Triangles (09 Hours)

Introduction, Finite element modeling, Constant strain triangle, In plane and bending, problem modeling and boundary conditions.

Axisymmetric Solids Subjected to Axisymmetric Loading: Introduction, Axisymmetric formulation, Finite element modeling, Triangular element, Problem modeling and boundary conditions.

Module - IV: Two-dimensional isoparametric Elements and Numerical Integration (09 Hours)

Introduction, The four-node quadrilateral, Numerical integration, requirements, h-refinement and p-refinement, Higher-order elements, Convergence

Beams and Frames: Introduction, Finite element formulation, Load vector, Boundary considerations, Shear force and bending moment, Beams on elastic supports, Plane frames.

Course Outcomes:

CO1 Understand the fundamental concepts behind stress-strain relationships, equilibrium, and energy methods used in FEA.

CO2 Apply finite element formulation techniques (potential energy, Galerkin method) for solving one-dimensional and structural problems.

CO3 Analyze plane stress, plane strain, and axisymmetric problems using CST elements and appropriate boundary conditions.

CO4 Design and formulate 2D isoparametric finite elements using shape functions, and apply numerical integration methods.

CO5 Evaluate stiffness matrices, forces, and displacements for structural components like beams, trusses, and frames using FEM techniques.

Text Book:

1. Introduction to Finite Elements in Engineering, by Tirupathi R. Chandrupatla, Ashok D. Belegundu

Reference Book

1. Introduction to Finite Element Method, by S.S.Rao
2. Finite Element Method, by O.C. Zienkiewicz.
3. Concepts and Applications of Finite Element Analysis, by Robert D.Cook.
4. Introduction to Finite Element Method, by J.N.Reddy.

MEPE3013 NON-CONVENTIONAL ENERGY SYSTEMS (3-0-0)

Course Objective:
The objective of this course is to introduce students to the principles, working mechanisms, applications, and challenges of various non-conventional energy systems. This course aims to develop a strong understanding of alternative energy technologies, their comparative advantages, limitations, environmental impacts, and their role in achieving energy security and sustainability.
It also aims to equip students with the knowledge to apply basic design and analysis strategies of renewable energy systems and critically evaluate their feasibility from technical and economic viewpoints.

Module 1: Introduction to Energy Systems and Need for Non-Conventional Sources
The world energy demand-supply mismatch and current dependence on fossil fuels. The environmental impact of conventional energy systems and the benefits of shifting to renewable sources. Classification of renewable energy sources, their availability in India and globally, energy efficiency, and conversion potential.
Present energy scenario (India & World)
Limitations of fossil fuels
Classification and scope of renewable energy
Energy conservation and sustainability
Future energy demands and role of green energy

Module 2: Solar Energy Systems
Capturing of solar energy and converting into heat or electricity for different uses, using photovoltaic and thermal solar systems. The design, performance, advantages, and limitations of each system.
Solar radiation measurement: Solar constant, angles
Solar thermal energy: Flat plate and concentrating collectors
Solar water heating, cooking, and drying
Solar photovoltaic system: Solar cells, types, efficiency
Solar inverters, battery, applications (rooftop/grid-tied systems)

Module 3: Wind Energy Systems
Basics of wind power generation, working of wind turbines and design considerations. Wind site assessment and turbine selection based on wind profiles.
Wind characteristics and wind power equation
Types of wind turbines (HAWT vs VAWT)
Components of wind turbines
Site selection criteria and wind data analysis
Wind farm design and grid integration

Module 4: Biomass, Geothermal, Ocean, and Hydrogen Energy
Biomass and biogas energy systems for rural and industrial. Geothermal, tidal, wave, OTEC, and hydrogen fuel cell systems.
Biomass resources and energy conversion routes
Biogas plants – types and operations
Geothermal energy: Types of reservoirs, extraction methods
Ocean energy: Tidal, wave, and OTEC systems
Hydrogen energy: Production methods, fuel cells, storage

Module 5: Environmental, Economic and Policy Aspects

The policy and economic issues that affect the adoption of renewable energy technologies. The environmental impact of renewable energy sources in comparison with fossil fuels. Indian government policies, incentives, subsidies, and the role of agencies like MNRE, IREDA.

Environmental benefits of renewable energy
Emission reductions and climate change mitigation
Cost analysis and payback period calculations
Government initiatives and policies (India & global)
Barriers to implementation and future trends

Course Outcomes: By the end of this course, students will be able to:

CO1 Understand the importance of non-conventional energy sources in the current global and national energy scenario.
CO2 Describe the working principle and components of solar energy systems, including photovoltaic and thermal systems.
CO3 Analyze the fundamentals of wind energy systems, understand their site selection, and evaluate wind turbine performance.
CO4 Explain the concepts of biomass, geothermal, ocean, and hydrogen energy systems, including their processes and applications.
CO5 Assess the environmental, economic, and policy implications of using non-conventional energy resources for sustainable development.

Textbooks:

1. B.H.Khan – Non-Conventional Energy Resources, McGraw-Hill.
2. G.D.Rai – Non-Conventional Energy Sources, Khanna Publishers.

Reference Books:

1. S.P. Sukhatme & J.K. Nayak – Solar Energy: Principles of Thermal Collection and Storage, Tata McGraw-Hill.
2. J. Twidell and T. Weir – Renewable Energy Resources, CRC Press.
3. D. Mukherjee and S. Chakrabarti – Fundamentals of Renewable Energy Systems.

MEPE3014 AUTOMOBILE ENGINEERING (3-0-0)

Course Objectives

The objectives of this course are to:

1. Introduce the basic structure, layout, and classification of automobiles and their subsystems.
2. Explain various automobile systems like fuel, cooling, lubrication, ignition, transmission, suspension, steering, and braking.
3. Develop understanding of the working principles of engine components and performance characteristics.
4. Familiarize students with emerging trends in automotive technologies such as electric vehicles and hybrid systems.
5. Enable troubleshooting and maintenance practices for core automobile systems.

Module - I (06 Hours)

Classification of automobiles, chassis, body, layout types, Sub-systems of automobile Power Unit: Functions and locations power for propulsion, Engine parts-types, construction and functions, multiple cylinder engines. General considerations of engine balance vibration, firing order road performance curves.

Module - II (08 Hours)

Fuel feed systems: fuel feed systems for petrol engines. Fuel pumps, Basic principles of MPFI and CRDI. Multipoint Fuel Injection Systems (MPFI), Common Rail Diesel Injection Systems (CRDI), Cooling system: purpose, types of cooling system, troubles and remedies of cooling system. Lubrication: Types of lubricants, multi viscosity oils, chassis lubrication. Engine lubrication: -types of lubricating systems, crankcase ventilation, and Engine lubrication troubles and remedies.

Module - III (07 Hours)

Transmission system: Construction, transmission, requirements of single plate friction clutch and multiplate clutch, clutch adjustments, clutch troubles and remedies. Gearboxes: Sliding mesh, constant mesh and synchromesh gearbox, function of overdrives, troubleshooting and remedies. Propeller shaft, Hotchkiss drive torque tube drive, differential, Final drive Types of rear axles.

Module - IV (07 Hours)

Braking system: Mechanical, hydraulic brakes, power brakes, airbrakes and vacuum brakes Fault finding and maintenance of brakes, Steering system: -Function, types of linkages, Steering gears, steering gear ratio. Wheel alignment, steering geometry, effects, Introduction of power steering. Suspensions: Types of Rigids, axle and independent suspension system, shock absorbers.

Module - V (08 Hours)

Starter motor drive-Bendix drive, overrunning clutch drive, Solenoid switch, Ignition system: Battery coil and magneto-ignition system, Ignition timing and its effect on engine performance, Ignition advance mechanisms, electronic ignition system. Electric vehicles: History, electrical vehicles and the environment pollution, description of electric vehicle, operational advantages, present EV performance and applications, battery for EV, Battery types of fuel cells, Solar powered vehicles, hybrid vehicles.

Course Outcomes:

CO1 Describe the classification, layout, power unit, and sub-systems of automobiles.

CO2 Explain the working and functions of fuel systems, cooling systems, lubrication, and ignition systems.

CO3 Analyze the construction and operation of transmission systems, gearboxes, and final drives.
CO4 Evaluate the performance, maintenance, and troubleshooting of steering, braking, and suspension systems.
CO5 Illustrate the construction, working, and advantages of electric and hybrid vehicles.

Essential Reading:

1. Jain K.K. and Asthana R.B, “Automobile Engineering” Tata McGraw Hill Publishers, New Delhi, 2002.
2. Kirpal Singh, “Automobile Engineering”, Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 13th Edition 2014.

Supplementary Reading:

1. Joseph Heitner, “Automotive Mechanics,” Second Edition, East-West Press, 1999.
2. Martin W, Stockel and Martin T Stockle , “Automotive Mechanics Fundamentals,” The Good heart - Will Cox Company Inc, USA ,1978. 5. Newton ,Steeds and Garet, “Motor Vehicles”, Butterworth Publishers,1989.

MEPE3015 DESIGN CONCEPTS IN ENGINEERING (3-0-0)

Course Objectives

The objectives of this course are to:

1. To study the various design requirements and get acquainted with the processes involved in product development.
2. To study the design processes to develop a successful product.
3. To learn scientific approaches to provide design solutions.
4. Designing solution through relate the human needs and provide a solution.
5. To study the principles of material selections, costing and manufacturing in design.

Module – I DESIGN TERMINOLOGY (09 Hours)

Definition-various methods and types of design - importance of product design - various design projects morphology of design - requirements of a good design - design guidelines - design catalogs - codes and standards design products and process cycles - bench marking.

Module - II INTRODUCTION TO DESIGN PROCESS (09 Hours)

Basic modules in design process – scientific method and design method – identification, importance of problem structured problem, real life problem – information gathering – customer requirements – Quality Function Developments (QFD) – detail design and engineering drawings – prototyping and testing – design for X.

Module – III CREATIVITY IN DESIGN (09 Hours)

Creativity and problem solving – vertical and lateral thinking – invention, diffusion – psychological view, mental blocks – creativity methods – brainstorming, mind map, concept map – theory of innovative problem solving (TRIZ) – axiomatic design.

Module – IV HUMAN AND SOCIETAL ASPECTS IN PRODUCT DEVELOPMENT (09 Hours)

Human factor in design, ergonomics, user friendly design – aesthetics and visual aspects – environmental aspects – marketing aspects – team aspects – legal aspects – presentation aspects.

Module – V MATERIAL AND PROCESSES IN DESIGN (09 Hours)

Material selection for performance characteristics of materials – selection for new design substitution for existing design – economics of materials – selection methods – recycling and material selection – types of manufacturing process, process systems – design for manufacture (DFM) – design for assembly (DFA).

Course Outcomes:

CO1 Analyse the various design requirements and get acquainted with processes involved in product development.
CO2 Apply the design processes to develop a successful product.
CO3 Apply scientific approaches to provide design solutions.
CO4 Design solutions through relate the human needs and provide a solution.
CO5 Apply the principles of material selection, costing and manufacturing in design.

Essential Reading:

1. Dieter. G.N., Linda C. Schmidt, “Engineering Design”, McGraw Hill,2013.
2. Horenstein, M.N., Design concepts for Engineers, Prentice Hall,2010 .

Supplementary Reading:

1. Edward B. Magrab, Satyandra K. Gupta, F. Patrick McCluskey and Peter A. Sandborn, “Integrated Product and Process Design and Development”, CRC Press, 2009.
2. Sumesh Krishnan and Mukul Shukla, Concept in Engineering Design, Notion Press, 2016.

HSHS3002 ENTREPRENEURSHIP DEVELOPMENT (3-0-0)

Course Objectives –

1. To explain concept of entrepreneurship and build and understanding about business situation in which entrepreneurs act.
2. To explain classification and type of entrepreneurs and the process of entrepreneurial project development
3. To discuss the steps in venture development and new trends in entrepreneurship.
4. The more focus is given on creativity and innovation.

Module-I: (10 hours)

Entrepreneurship: Concept of entrepreneurship and intrapreneurship, Types of Entrepreneurs, Nature and Importance, Entrepreneurial Traits and Skills, Entrepreneurial Motivation and Achievement, Entrepreneurial Personality

Module-II: (08 hours)

Entrepreneurial Environment, Identification of Opportunities, Converting Business Opportunities into reality. Start-ups and business incubation, Setting up a Small Enterprise. Issues relating to location, Environmental Problems and Environmental pollution Act, Industrial Policies and Regulations

Module-III: (10 hours)

Need to know about Accounting, Working capital Management, Marketing Management, Human Resources Management, and Labour Laws. Organizational support services - Central and State Government, Incentives and Subsidies.

Module-IV: (12 hours)

Sickness of Small-Scale Industries, Causes and symptoms of sickness, cures of sickness, Role of Banks and Governments in reviving industries.

Course Outcomes

After completion of this course, students

CO1: will aware about foundation of entrepreneurship development and its theories
CO2: will identify the type of entrepreneur and the steps involved in a entrepreneurial venture.
CO3: will understand various steps involved in starting a venture and to explore marketing methods & new trends in entrepreneurship.
CO4: Think creative and innovative

Books:

1. Entrepreneurship Development and Management, Vasant Desai, HPH
2. Entrepreneurship Management, Bholanath Dutta, Excel Books
3. Entrepreneurial Development, Sangeeta Sharma, PHI
4. Entrepreneurship, Rajeev Roy, Oxford University Press

HSHS3001 BUSINESS MANAGEMENT (3-0-0)

Course Objectives

By the end of this course, students will be able to:

- Understand fundamental management principles
- Learn project management techniques and its application
- Understand the financial aspects of engineering decisions
- Demonstrate leadership, communication, and team management skills
- Understand the basics of entrepreneurship and innovation management

Module-I: Management Foundations and Organizational Dynamics

Introduction to Management: Functions of Management; Evolution of management thought and its relevance to engineering; Management vs. Leadership: Key distinctions; Decision-making processes; Organizational design and structure; Team dynamics and group behaviour; Motivation theories and their application to technical teams; Organizational Communication; Cultural considerations in global business environment

Module-II: Project Management and Financial Decision Making

Project lifecycle and phases; Work breakdown structure and scheduling; Resource allocation and budgeting; Risk management in engineering projects; Quality management and control; Basic financial statements and their interpretation; Time value of money; Budgeting and cost control; Return on investment (ROI) and net present value (NPV); Funding sources for engineering projects; Cost-benefit analysis for technical decisions

Module-III: Leadership, Innovation and Entrepreneurship

Leadership styles and their effectiveness; Managing technical teams and professionals; Performance management and feedback; Recruitment and selection in engineering roles; Training and development of technical staff; Ethical leadership in engineering; Innovation management; Technology transfer and commercialization; Startup fundamentals; Intellectual property basics; Business model development

Course Outcomes

CO1: Recall fundamental management principles, organizational theories, and project management methodologies, key financial concepts used in engineering decision-making.
CO2: Explain the relationship between management functions (planning, organizing, leading, controlling) and their application.
CO3: Demonstrate project management skills and apply financial analysis techniques for decision making.
CO4: Analyse organizational behaviour patterns, team dynamics, and performance issues in engineering management contexts.
CO5: Judge ethical implications of management decisions and leadership actions in professional engineering practice.
CO6: Create integrated management solutions for solving complex business problems.

Reference Books:

1. Management Theory and Practice" by C.B. Gupta
2. Essentials of Management" by Koontz, Weihrich, and Aryasri (Indian Edition)
3. Project Management for Engineering and Technology" by N.K. Sharma
4. Financial Management: Theory and Practice" by Prasanna Chandra
5. Organizational Behaviour" by Aswathappa K.
6. Human Resource Management" by V.S.P. Rao
7. Entrepreneurship Development" by S.S. Khanka
8. Operations Management" by R. Panneerselvam

MCMC3002 INDUSTRIAL SAFETY ENGINEERING (3-0-0)

Course Objectives:

1. Students will be able to recognize and evaluate occupational safety and health hazards in the workplace, and to determine appropriate hazard controls following the hierarchy of controls.
2. Students will furthermore be able to analyze the effects of workplace exposures, injuries and illnesses, fatalities and the methods to prevent incidents using the hierarchy of controls, effective safety and health management systems and task-oriented training.

Course Outcomes:

By the end of this course, a student should:

CO1: Evaluate workplace to determine the existence of occupational safety and health hazards
CO2: Identify relevant regulatory and national consensus standards along with best practices that are applicable.
CO3: Select appropriate control methodologies based on the hierarchy of controls
CO4: Analyze injury and illness data for trends

Module-I: (07 hrs)

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

Module-II: (07 hrs)

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Module-III: (07 hrs)

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

Module-IV: (07 hrs)

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

Module-V: (08 hrs)

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, McGraw Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

MCMC3001 ENVIRONMENTAL ENGINEERING (3-0-0)

Course Objectives:

- To acquire basic knowledge of source of water and various treatment processes
- To determine the sewage quantity, and understand its treatment and disposal
- To Identify and value the effect of the pollutants in atmosphere
- To formulate strategies to solid waste management

Module-I: (08 Hrs)

Water: Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes.

Module-II: (08 Hrs)

Sewage- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes.

Module-III: (08 Hrs)

Air - Composition and properties of air, Quantification of air pollutants, monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution automobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and interrelationship. Air quality standards, Control measures for Air pollution, construction and limitations

Module-IV: (08 Hrs)

Noise-Basic concept, measurement and various control methods. Solid waste Management-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods- Integrated solid waste management. Hazardous waste: Types and nature of hazardous waste as per the HW Schedules of regulating authorities.

Course Outcomes:

After successfully studying this course, students will able to:

- Understand the impact of humans on environment and environment on humans
- Identify and value the effect of the pollutants on the environment: atmosphere, water and soil
- Formulate strategies to control, reduce and monitor pollution
- Determine the most appropriate technique for the treatment of water, wastewater solid waste and contaminated air

Books

- Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
- Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
- Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw -Hill International Editions, New York 1985.
- MetCalf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi

CSPS3202 PROJECT FOR PRODUCT DEVELOPMENT - I (0-0-6)

Course objectives:

Learning outcomes Upon completing the course, students are expected to be able to:

- Plan and execute independently projects aimed at collecting, systematize and analyze information about markets and customer contexts as fundamental supporting elements for product development in specific sectors and industrial fields,
- Apply the most important models for organizing and managing product development and its implementation in concrete commercial setting,
- Analyze complex product development situations and, based on such analysis, suggest relevant strategies, plans and action programs for various types of companies and organizations,
- Identify the need of further knowledge and tools (both analytics and computer-based) to conduct product development tasks,
- Evaluate critically the result of a product development project and, based on such an evaluation, reflect on uncertainty and risks in execution, so to be able to suggest alternative conclusions.

Instruction

The course is organized as an independent project conducted in teams of 4-5 students with the aim of developing an idea all the way to a product ready for launch for a specific firm. This work is supported by methodological lectures. The project work is presented during a series of seminars with oppositions acting as ”control gates” and leading to a final seminar where a decision on launching or not the product is taken by an opponent group.

MEPC3204 IC ENGINES AND GAS TURBINES LAB (0-0-3)

List of Experiments:

IC Engines Experiments

1. Performance test on a 4-stroke diesel engine – Determine brake power, indicated power, mechanical efficiency, BSFC, and heat balance.
2. Performance test on a 4-stroke petrol (SI) engine – Evaluate power output, fuel consumption, and overall efficiency.
3. Morse test on a multi-cylinder petrol engine – Determine indicated power of each cylinder.
4. Retardation test (motoring test) – Determine frictional power of the engine.
5. Study of fuel-injection systems – In-line pump, rotary pump, CRDI systems and injection characteristics.

Heat Transfer Experiments

1. Heat transfer by natural convection – Determine heat transfer coefficient from a vertical or horizontal cylinder/plate.
2. Heat transfer by forced convection – Determine the convective heat transfer coefficient in a forced air flow duct.
3. Thermal conductivity of insulating material – Measure thermal conductivity using a guarded hot plate or heat flow meter.
4. Heat transfer in a shell-and-tube heat exchanger – Determine LMTD and overall heat transfer coefficient.
5. Radiation heat transfer experiment – Study Stefan-Boltzmann law and emissivity measurement (optional, if needed).

MEPC3205 MECHANICAL VIBRATION LAB (0-0-3)

List of Experiments

1. Mass – Spring system
2. Simple and Compound Pendulums
3. Mass Moment of Inertia Estimation-Part one: Bifilar Suspension
4. Mass Moment of Inertia Estimation-Part two: Auxiliary Mass Method
5. Forced Vibration with Negligible Damping
6. Transverse Vibration of a Beam
7. Undamped vibration absorber
8. Static and Dynamic Balancing