

Course Outcomes:

ENGINEERING GRAPHICS & MODELING

1. Understand the concepts of engineering drawing of planes, solids and the CAD drawing software.
2. Conceptualize and draw the projections of points and straight lines.
3. Visualize and project different views of a planes and solids.
4. Analyze given solids and represent sectional views.
5. Generate isometric and corresponding orthographic views of any given component.

ENGINEERING MECHANICS

1. Understand and apply the concepts of force, moment and their resolutions.
2. Analyze and apply the concepts of friction.
3. Calculate area and mass Moment of Inertia for given cross-sections.
4. Analyze the motion of bodies considering the cause of motion. Appreciate and apply the concept of Work-Energy method.
5. Understand the kinetics of rigid body in translation and rotation

ENGINEERING WORKSHOP

1. Understanding the tools and methods of using to fabricate engineering components
2. Applying the measuring techniques to verify the dimensional accuracy
3. Evaluating various methods and trades of workshop in the component building

MATERIALS TECHNOLOGY

1. Understand the structure of metals and constitution of alloys with phases.
2. Understand the basic concepts of phase transformation during solidification and phase diagrams.
3. Understand different heat treatment processes and their influence on properties of metals and alloys.
4. Understand classifications of steels, cast irons and their alloys. Analyze the structure and properties of different non-ferrous metals.
5. Evaluating the applications of composite and ceramic materials.

MECHANICS OF SOLIDS

1. Understand the concepts of stress, strain and material properties. Derive basic stress strain equations with appropriate assumptions.
2. Appreciate the concepts of shear force and bending moments. Generate shear force and bending moment diagrams for any given beam problem.
3. Determine the stresses and strains in the members subjected to bending and shear and interpret the stress distribution across various beams like rectangular, circular, triangular, I, T and angle sections.
4. Calculate and analyze principal stresses and strains. Determine the slope and deflection of beams under different types of loadings.
5. Analyze and compute stresses and strains in thin and thick cylinders

THERMODYNAMICS

1. Identify thermodynamic systems, understand concepts of zeroth law, first law, work and heat interactions.
2. State and illustrate second law of thermodynamics. Identify and explain concepts of entropy, enthalpy, specific energy, reversibility, availability and irreversibility.
3. Understand the concepts of phase transformation of pure substance.
4. Appreciate the concepts of perfect gas laws. Analyze mixtures of perfect gases.
5. Understand power cycles and evaluate the performance.

PRODUCTION TECHNOLOGY

1. Understand the basic concepts of casting processes to make different engineering components of industrial applications.
2. Differentiate the types of welding processes and decide which type of process to be selected for any given industrial application.
3. Recognize the differences between hot working and cold working processes and understand the processes of various forging operations.
4. Understand the basic principles of sheet metal operations and known the principles of drawing and extrusion processes.
5. Appreciate the process of high velocity forming and understand different types of plastics.

METALLURGY AND MECHANICS OF SOLIDS LAB

1. Understand and identify microstructure of metals and measure their mechanical properties.
2. Analyze the microstructure and mechanical properties of metals by applying metallurgical principles.
3. Compare the hardness and mechanical properties of treated and untreated steels tested.

PRODUCTION TECHNOLOGY LAB

1. Understand the operating methods of welding mechanical press and moulding machines.
2. Measuring the properties of moulding sand.
3. Evaluate the quality of welded joints and products made by mechanical press.

METALLURGY AND MECHANICS OF SOLIDS LAB

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PRODUCTION TECHNOLOGY LAB

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MACHINE DRAWING & DRAFTING

1. Prepare the engineering drawings by employing conventional representation.
2. Develop the assembly drawings using part drawings of machine components.
3. Applying the drawing practice using solid works software.

KINEMATICS OF MACHINERY

1. Understand working principles of different lower and higher pairs, mechanisms and their inversions.
2. Mathematical modeling of mechanisms to compute velocity and accelerations of links.
3. Understanding various steering gear mechanisms and Hooke's joint.
4. Appreciate different cams and followers used in mechanical systems.
5. Appreciate the concepts of velocity in gearing systems.

THERMAL ENGINEERING

1. Understand the concepts of actual cycles and their analysis.
2. Analyze the combustion phenomenon in SI engines.
3. Analyze the combustion phenomenon in CI engines.
4. Understand the testing and performance of IC engines.
5. Know about the alternative fuels and appreciate the recent trends in IC engines.

MECHANICS OF FLUIDS AND HYDRAULIC MACHINES

1. Understand the principles of flow and energy momentum equations.
2. Analyze the losses in pipe flow, boundary layer, separation of flows, forces on different vanes. Able to quantify the flow of fluid in flow measurement instruments.
3. Understand the working of hydraulic machinery and analyze their characteristic curves.
4. Appreciate the working principles of pumps and their applications.

MECHANICS OF FLUIDS AND HYDRAULIC MACHINES LAB

1. Test performance of different turbines.
2. Test performance of different pumps.
3. Evaluate the test results of hydraulic machinery with the standard reference values.

METROLOGY & MACHINE TOOLS

1. Understand the mechanics of metal cutting and working principles of lathe machines.
2. Understand the working, classification, specifications and kinematic schemes of shaping, planing, drilling and boring machines.
3. Practicing the operations of milling, grinding, lapping, honing and broaching machines.
4. Understand the concepts of limits, fits and interchangeability. Design of GO and NO GO gauges.
5. Measuring different parameters of surface roughness and the working of Coordinate Measuring Machine.

DYNAMICS OF MACHINERY

1. Understand gyroscopic effects of rotating bodies for aero planes, naval ships, automobiles, and two wheelers. Appreciate the working of brakes and dynamometers.
2. Compute frictional torque in clutches and understand the applications of Governors in mechanical systems.
3. Perform static and dynamic force analysis of planar mechanisms. Diagrammatically represent turning moment and design flywheels.
4. Understand how to balance rotating and reciprocating masses in different planes.
5. Perform calculations pertinent to several parameters of free and forced vibrations.

DESIGN OF MACHINE MEMBERS-I

1. Understand the design procedure and selection of material for a specific application. Analyze the simple stresses and strains in components.
2. Appreciate variable stresses in mechanical components, fatigue analysis and fatigue theories of failure.
3. Design fastened joints like riveted and welded joints.
4. Design various joints like bolted joints, keys, cotter joints and knuckle joint.
5. Design shafts for strength and rigidity. Design rigid and flexible shaft couplings.

APPLIED THERMODYNAMICS

1. Understand the working of steam power plants and boilers.
2. Perform Thermodynamic analysis of nozzles and condensers.

3. Analyze impulse and reaction steam turbines and subsequently apply to real time scenarios.
4. Understand working of different types of compressors and gas turbines.
5. Appreciate different types of propulsive engines and rockets.

AUTOMOBILE ENGINEERING **(Professional Elective – 1)**

1. Understand the components of automobile engines and appreciate the working of lubrication and cooling systems. Know about the fuel systems in SI engine and CI engines.
2. Appreciate the functions and importance of ignition and electrical systems.
3. Elucidate the working principles, types and importance of transmission and suspension systems.
4. Appreciate the working principles, types and importance of braking and steering systems.
5. Understand the environmental implications of automobile emissions and application of various alternative fuels.

MECHATRONICS **(Professional Elective – 1)**

1. Interpret the importance of mechatronics and elements involved.
2. Evolve at various drives for typical applications in mechatronics
3. Understand various drives and circuits
4. Predict the importance and functioning of various electronic components.
5. Choose various mechatronic elements to design mechatronics based systems

ADDITIVE MANUFACTURING **(Professional Elective – 1)**

1. Understand the working principle and process parameters of AM processes
2. Understand data formats of additive manufacturing
3. Appreciate Liquid-Based and Solid-Based additive manufacturing systems.
4. Apply the rudiments of Powder Based additive manufacturing Systems
5. Evaluate the applications of additive manufacturing in the industry

THERMAL ENGINEERING LAB/ METROLOGY & MACHINE TOOLS LAB

1. Understand the assembly/disassembly and their working of IC engines for performance measurement.
2. Evaluate performance parameters for consequent applications.
3. Perform the machining operations and the measurement of samples using instruments.

DESIGN OF MACHINE MEMBERS – II

1. Understand different sliding contact and rolling contact bearings and perform design calculations
2. Analyze design considerations of IC engine parts like piston, connecting rod and cylinder
3. Appraise the design aspects of belt drives and springs
4. Design spur gear drives by calculating different parameters
5. Compute design parameters of helical gear drives

HEAT TRANSFER

1. Understand the basic modes of heat transfer, steady and unsteady periodic heat transfer.
2. Solve 1-D problems of steady state and transient conduction heat transfer.
3. Appreciate concepts of convective heat transfer process and evaluate heat transfer coefficient for free and forced convection over exterior and interior surfaces with proper boundary conditions.
4. Applying the boiling and condensation principles in the heat transfer equipment design.
5. Analyze the performance of heat exchangers by LMTD and NTU methods. Appreciate radiation heat transfer scenarios.

FINITE ELEMENT METHOD

1. Understand the basics of FEM, stress-strain relations and gain knowledge of Weighted Residual Methods and Variational Methods.
2. Solve 1-D problems by applying the pertinent boundary conditions.
3. Analyze and formulate finite element equations for 1-D planar truss element and beam element.
4. Solve 2-D problems using CST element and integration using Numerical Integration method.
5. Analyze and solve 1-D and 2-D heat transfer problems using FEM. Formulate Finite element equations for a stepped bar and a beam using dynamic analysis.

REFRIGERATION AND AIR CONDITIONING **(Professional Elective – 2)**

1. Understand the basic concepts of refrigeration and thermodynamically analyze air refrigeration systems.
2. Appreciate the working principle and thermodynamically analyze vapor compression refrigeration system.
3. Understand the working principles of vapor absorption and steam jet refrigeration systems.
4. Estimate the air conditioning load for comfort and industrial applications by applying the principles of psychrometry and design conditions.
5. Appraise Air Conditioning Systems and calculate the Cooling Load.

INDUSTRIAL MANAGEMENT **(Professional Elective – 2)**

1. Understanding the principles of management.
2. Compare various organizational structures for effective management
3. Apply the concepts of production management concepts
4. Evaluate the project in terms of time and method of execution for better quality
5. Applying the modern management concepts with scheduling techniques

AUTOMATION IN MANUFACTURING **(Professional Elective – 2)**

1. Summarize the facets of automation in a manufacturing activity.
2. Applying various elements like sensors, pneumatics, and hydraulics to append in manufacturing automation.
3. Design the assembly lines by considering the on line process analysis.
4. Evaluate the automation elements for low cost automation investment.
5. Applying the automation concepts in automobile and manufacturing sectors

HEAT TRANSFER LAB

1. Understand the structural features of heat transfer equipment and their mode of working.
2. Analyze the output responses by comparing with the heat transfer governing equations.
3. Evaluate the process parameters for designing the heat transfer devices.

COMPUTER AIDED ENGINEERING LAB

1. Build FE models of mechanical components under various loading conditions.
2. Understand conductive and convective heat transfer analysis of 1-D & 2-D components.
3. Evaluate Modal analysis of beams, plates and shells for natural frequencies and mode shapes with different elements

INSTRUMENTATION AND CONTROL SYSTEMS

1. Define basic terms related to measurements, understand displacement measurement techniques.
2. Understand working principles of pressure and temperature measuring instruments.
3. Appraise the working of various flow, level, and speed measurement instruments.
4. Model and analyze acceleration, vibration, stress, strain, force, torque and power measuring methods.
5. Understand control systems and their applications.

CAD/CAM

1. Appreciate CAD/CAM principles and know the various input and output peripherals of computers. Understand concepts of computer graphics.
2. Develop mathematical models to represent curves, surfaces and solids.
3. Understand numerical control systems and develop CNC part programs. Appraise the rudiments of Group Technology.
4. Understand Computer Aided Quality Control and Computer Integrated Manufacturing Systems.

5. Applying FMS concepts for production of engineering components.

ROBOTICS
(Professional Elective – 3)

1. Understand the basic concepts of robotics and know the components of industrial robots.
2. Derive forward and inverse kinematic models for robots.
3. Decide upon the selection of actuators and sensors for robots.
4. Appreciate different programming techniques and languages for robots.
5. Comprehend industrial applications and work cell design of robots.

GAS DYNAMICS
(Professional Elective – 3)

1. Understanding the features of different flows.
2. Comparing the flow in different cross sectional arcs.
3. Apply gas dynamics principles to Jet propulsion system.
4. Evaluate the effects with and without shocks during flow.
5. Designing the aviation components using gas dynamics principles

PRODUCTION AND OPERATIONS MANAGEMENT
(Professional Elective – 3)

1. Understand the importance of production and operations management for getting the competitive edge.
2. Analyze the factors effecting plant location and the volume of production to be made.
3. Apply the value engineering and work study method to standardize the manufacturing activity.
4. Evaluate the project management techniques to improve overall productivity.
5. Designing the production systems with the effective PPC principles

OPERATIONS RESEARCH

(Professional Elective – 4)

1. Model the real life situations with mathematical models. Understand the concept of linear programming.
2. Solve transportation and assignment problems.
3. Understand the various waiting lines and replacement concepts.
4. Identify and apply game theory and inventory models.
5. Apply Sequencing shop floor problems and network scheduling models.

ENERGY CONSERVATION AND MANAGEMENT

(Professional Elective – 4)

1. Understand the energy data to carry out audit.
2. Identifying the electrical, thermal and other systems with their energy consumption.
3. Perform energy audit of consumption of industries.
4. Evaluate the energy consumption of units by the economic concepts.
5. Designing the mechanical systems employing energy conservation principles

FLUID POWER SYSTEMS

(Professional Elective – 4)

1. Understand the properties fluid and fluid power systems.
2. Apply accessories and valves in the systems for effective functioning.
3. Design and analyze typical hydraulic circuits.
4. Evaluate the systems with different control units.
5. Designing the modern fluid power systems with the hydraulic principles

CAD/CAM LAB

1. Understand the usage of relevant software and the syntax of CNC part program.
2. Develop the 2D, 3D models and conduct the analysis.
3. Evaluate the veracity between manual part program and the automated part program.

PRODUCTION DRAWING PRACTICE AND INSTRUMENTATION LAB

1. Understanding the symbols and their representation on drawings.
2. Calibrate the measuring devices and analyze the errors in measurement.
3. Evaluate the instruments in terms of accuracy and precision.

INDUSTRY ORIENTED MINI PROJECT

1. Apply the engineering principles in the execution of a sub system under mechanical engineering domain.
2. Predict and solve the related issues of the sub system.
3. Evaluate the effectiveness of the sub systems the light of technical, ethical and other standards.

PRODUCTION PLANNING & CONTROL

1. Understand the basic concepts of production planning and control.
2. Appreciate principles and importance of forecasting techniques.
3. Analysis of various inventory management and control systems. Plan the stock required based on various methods like MRP, ERP, LOB, JIT and other Japanese concepts.
4. Know the factors of routing and schedule. Apply standard scheduling methods and line balancing.
5. Appreciate dispatching procedure and application of computer in production planning and control.

UNCONVENTIONAL MACHINING AND PROCESSES

1. Understand the need, importance and classification of various unconventional machining processes.
2. Appreciate basic principles and process parameters of ultrasonic, water jet and abrasive jet machining processes.
3. Appreciate thermal energy based machining processes with emphasis on surface finish and accuracy.
4. Appraise different chemical material removal processes.
5. Understand electron beam machining and plasma arc machining along with applications.

TECHNICAL SEMINAR

1. Synthesizing information on any one specialized topic from text books, peer revised journals, hand books and other technical resources.
2. Generation a technical seminar report comprising of all relevant information with stipulated standards.
3. Judge the veracity of the topic with various time domains
- 4.

COMPREHENSIVE VIVA VOCE

1. Revise the mechanical engineering principles postulations and other technical information in order to apply in various conditions.
2. Explain the relevance of a technical note for a given application.
3. Collate and justify the design by the acquired comprehensive technical knowledge and skill.

MAJOR PROJECT

1. Develop a model comprising of real time application in the industry.
2. Design a system under the domain of mechanical engineering.
3. Evaluate for simulation design, analysis and manufacturing facts of the system.