

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.

ENGINEERING GRAPHICS & MODELING

1. Comprehend the concepts of engineering drawing and CAD software.
2. Conceptualize and draw the projections of points and straight lines.
3. Visualize and project different views of a planes and solids.
4. Evaluate the surfaces of solids developed for further processing in the engineering applications.
5. Generate isometric and corresponding orthographic views of any given component

ELEMENTS OF MECHANICAL ENGINEERING

1. Understand the operation, usage and applications of different measuring instruments and tools.
2. Prepare simple composite components and joining different materials using soldering process.
3. Identify tools & learn practically the process of turning, milling, grinding on mild steel pieces.

ENGINEERING MECHANICS

1. Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
2. Solve problem of bodies subjected to friction.
3. Find the location of centroid and centre of gravity of the composite sections.
4. Compute moment of inertia of various sections
5. Analyze the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion

ENGINEERING MATERIALS

1. Classify the various materials that will be essential for the mechanical engineering applications and testing for their mechanical properties
2. Understanding the composition and properties of Ferrous and Non-Ferrous Alloys
3. Analyze the manufacturing methods of composite materials for their overall feasibility
4. Evaluate the properties of ceramics and polymers employed in engineering components
5. Understanding the features of nano materials and high entropy alloys for engineering applications

MECHANICS OF SOLIDS

1. Understand the internal forces, moments, stresses, strains, and deformations in structures made of various materials acted on by a variety of loads.
2. Appreciate the concepts of shear force and bending moments. Generate shear force and bending moment diagrams for any given beam problem.
3. Develop the bending formula and apply to the design of beams.
4. Applying the theories of elastic failure for structure under consideration and evaluating principal stresses and strains.
5. Analyzing the failure of shafts under the torsional forces.

METALLURGY & MATERIAL SCIENCE

1. Understand the types of Crystal structures and their defects.
2. Comprehend the basic concepts of phase transformation during solidification employing phase diagrams.
3. Demonstrate importance of critical understanding of heat treatment in achieving required properties.
4. Apply the knowledge of heat treatment to enhance surface properties.
5. Analyze the properties and micro structure of ferrous and non-ferrous alloys.

PRODUCTION TECHNOLOGY

1. Understand the basic concepts of casting processes to make different engineering components of industrial applications.
2. Identify the importance of permanent joining and principle behind different welding processes.

3. Evaluating the welded components for their defects using destructive and non-destructive testing methods.
4. Distinguish the hot working and cold working processes and recognize the processes of various rolling operations.
5. Elaborates the uniqueness of extrusion and forging processes in metal working.

THERMODYNAMICS

1. Understand the basics of Thermodynamics
2. Apply first and second laws of thermodynamics to different systems
3. Appreciate the concepts of phase transformation of pure substance.
4. Analyze mixtures of perfect gases and understanding the concepts of perfect gas laws.
5. Evaluate the performance of power cycles

PRODUCTION TECHNOLOGY LABORATORY

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

MATERIAL SCIENCE & MECHANICS OF SOLIDS LABORATORY

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. Evaluate the hardness and mechanical properties of treated and untreated steels.

COMPUTER AIDED MACHINE DRAWING

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. Draw the velocity and acceleration polygons to compute their magnitude.
3. Understanding various steering gear mechanisms and Hooke's joint.
4. Appreciate different cams and followers used in mechanical systems.

5. Evaluating the number of teeth and velocity ratio required in gearing systems.

FLUID MECHANICS & HYDRAULIC MACHINES

1. Understand fluid properties and fluid statics.
2. Identify type of fluid flow patterns, measuring fluid pressure and describe continuity equation.
3. Evaluate the flow losses in pipes and evaluating the forces on different vanes.
4. Analyze the performance of various turbines.
5. Appreciate the working principles of pumps and their applications

IC ENGINES & GAS TURBINES

1. Understand the concepts of IC Engine systems and its classification.
2. Analyze the combustion phenomenon in SI and CI engines.
3. Evaluate the testing and performance parameters of IC engines.
4. Evaluate the working principles of compressors in industrial applications.
5. Computation of performance characteristics of gas turbines.

INSTRUMENTATION AND CONTROL SYSTEMS

1. Understand the basic terms related to measurements and errors.
2. Appraise the displacement and Temperature measuring instruments.
3. Evaluate the working of various physical variable Level and pressure measuring instruments.
4. Comprehend the measuring of stress-strain developed in engineering components.
5. Comprehend the concept of control system and Force, Torque and Power measuring instruments.

FLUID MECHANICS & HYDRAULIC MACHINES LABORATORY

1. Test for the performance of different turbines and pumps.
2. analyze a variety of practical fluid flow and measuring devices
3. Evaluate the test results of hydraulic machinery with the standard reference values.

INSTRUMENTATION LABORATORY

1. Understanding the different devices for measuring mechanical parameters.
2. Calibrate the measuring devices and analyze the errors in measurement.
3. Evaluate the instruments in terms of accuracy and precision

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.

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.
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STEAM POWER & JET PROPULSION

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.

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.

DESIGN OF MACHINE ELEMENTS

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.

THERMAL ENGINEERING LABORATORY

CO1: Understand the assembly/disassembly and their working of IC engines for performance measurement.

CO2: Analyze the output responses of the IC engines by applying thermodynamic principles.

CO3: Evaluate performance parameters for consequent applications.

METROLOGY & MACHINE TOOLS LABORATORY

CO1: Understand the kinematic structure of machine tools and their mode of working.

CO2: Perform the machining operations and the measurement of samples using instruments.

CO3: Evaluate the responses for their accuracy and precision.

CAD/CAM LABORATORY

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.

MACHINE DESIGN

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.

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 LABORATORY

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

INDUSTRY ORIENTED MINI PROJECT/INTERNSHIP

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.

INDUSTRIAL MANAGEMENT

1. Understand the principles of management.
2. Able to design the organization structure.
3. Apply the techniques for plant location, design plant layout and value analysis.
4. Able to carry out work study and allied techniques.
5. Able to do job evaluation and human resource management effectively

REFRIGERATION AND AIR CONDITIONING

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.

PROJECT STAGE-I

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification, formulation, and design engineering solutions.
3. Demonstrate the methodology of the proposed project

ADDITIVE MANUFACTURING

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

COMPOSITE MATERIALS

Knowledge of the crystal structures of a wide range of ceramic materials and glasses.

2. Able to explain how common fibers are produced and how the properties of the fibers are related to the internal structure.
3. Able to select matrices for composite materials in different applications.
4. Able to describe key processing methods for fabricating composites.
5. Evaluate the properties of composites.

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.

MICROPROCESSOR IN AUTOMATION

1. Develop proficiency in understanding number systems, codes (BCD, Excess 3), and designing digital circuits using logic gates etc.
2. Attain a comprehensive understanding of 8085 microprocessor architecture, functional blocks, and timing/control signals.
3. Master 8085 assembly language programming and interfacing peripherals such as programmable interrupt controller (8255).
4. Acquire skills in interfacing analog-to-digital and digital-to-analog converters.
5. Understand the practical applications of microprocessors in diverse industries.

INDUSTRY 4.0

1. Explain Smart Business Perspective, Cyber security, Impacts of Industry 4.0.
2. Understand the basics of the Industrial Internet of Things.
3. Understand various key technologies.
4. Implement various sensors and actuators.
5. Understand different industrial transmission technologies and IIOT applications in real life

INDUSTRIAL ROBOTICS

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.
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7. OPERATIONS RESEARCH (Professional Elective – III)

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.

COMPUTATIONAL FLUID DYNAMICS

(Professional Elective – III)

Course Outcomes:

1. Understand different types of Partial Differential Equations and to know and understand appropriate numerical techniques.
2. Solve the simple heat transfer and fluid flow problems using different numerical techniques, viz., FDM.
3. Understand and to appreciate the need for validation of numerical solution.

TOTAL QUALITY MANAGEMENT

(Professional Elective – III)

1. Outline the Dimensions and Barriers regarding with Quality
2. Illustrate the TQM Principles.
3. Demonstrate Tools utilization for Quality improvement.
4. Explain the various types of Techniques are used to measure Quality.
5. Apply various Quality Systems and Auditing on implementation of TQM.

SOLAR ENERGY TECHNOLOGY

(Professional Elective – III)

1. Gain expertise in analyzing solar angles, employing Sun path diagrams, and evaluating the thermal performance of various solar collectors.
2. Acquire a deep understanding of the operation of solar heating/cooling systems, thermal energy storage.
3. Develop proficiency in semiconductor physics, comprehend solar cell properties, and analyze efficiency limits.
4. Factors such as shadow analysis, reliability, autonomy, and economic aspects of solar photovoltaic systems.
5. Attain expertise in passive heating and cooling concepts and understanding bioclimatic classifications

RE- ENGINEERING

1. Familiarize with the process of reverse engineering and its applications.
2. Understand the methodologies and techniques for Reverse Engineering.
3. Learn various data collection techniques and the data processing chain.
4. Select a proper system to generate geometric representations of physical objects.
5. Integrate Reverse Engineering and Rapid Prototyping.

NON-CONVENTIONAL ENERGY SOURCES

1. Understanding Non-conventional energy sources
2. Knowledge of working principle of various energy systems
3. Capability to carry out basic design of Non-conventional energy systems.
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AUTOMOBILE ENGINEERING

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.

ELECTRIC AND HYBRID VEHICLES

1. Get a good understanding of the basic functioning of both Electric and Hybrid vehicles and their performance
2. Develop a good concept of the electrical vehicle modeling and its power plant characteristics.
3. To understand the fundamentals of chargers related to both electric & hybrid vehicle operation & energy management.
4. Have a detailed understanding of electric propulsion systems, types of motors and the other important subsystems in Electric vehicles.
5. Have clear concepts of the different possible energy storage systems for both electric and hybrid vehicles.

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.
Understand electron beam machining and plasma arc machining along with applications.

PLANT LAYOUT AND MATERIAL HANDLING

Understand different plant layouts, selection and comparison of process and product layouts.

2. Understand heuristics for plant layouts like ALDEP, CORELAP and CRAFT.
3. Get an overview of material handling systems and relationship between material handling and plant layout.
4. Appreciate various methods of material handling like path and function oriented systems.
5. Minimize cost of material handling with safety prerequisites

POWER PLANT ENGINEERING

1. Understand the layout of steam power plant and know different handling systems. Appreciate the working principles of various components responsible for combustion.

2. Comprehend the layout of diesel power plant with detailed emphasis on its auxiliaries.
3. Know the working of hydroelectric power plants and characteristics of hydrographs.
4. Identify the advantages, disadvantages & applications of nuclear power plants.
5. Analyze and estimate different power plant economic factors and environmental considerations

PROJECT STAGE-II including seminar

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.

BASIC MECHANICAL ENGINEERING

1. Understand the basic concepts of mechanical engineering.
2. Apply principles of engineering mechanics in mechanism and machines
3. Develop manufacturing methods to produce engineering components.
4. Evaluate alternative designs for the engineering components
5. Select a suitable type of automation applicable for any industry.

PRODUCT ENGINEERING

1. Illustrate creativity and study the techniques of innovation
2. Assess the evaluation techniques for screening ideas
3. Differentiate the IPR-Patents, Design patents, copy right and trade mark and their laws.
4. Describe the interaction between design, manufacture, quality and testing
5. Establish the machining time in various cutting operations; value engineering; GT and concepts of concurrent engineering.

MATERIALS & APPLICATION

6. Classify the various materials that will be essential for the mechanical engineering applications and testing for their mechanical properties
7. Understanding the composition and properties of Ferrous and Non-Ferrous Alloys
8. Analyze the manufacturing methods of composite materials for their overall feasibility
9. Evaluate the properties of ceramics and polymers employed in engineering components
10. Understanding the features of nano materials and high entropy alloys for engineering applications

INDUSTRIAL ENGINEERING

1. Understanding the concepts of industrial engineering in order to improve overall productivity of a given system
2. Analysing various layout factors with a view to reduce the cost per unit of production at different prospective layout
3. Designing the production plan with a high throughput at a given point of time
4. Reducing the inventory by evaluating various costs
5. Creating a quality system by following principles

BASIC AUTOMOBILE ENGINEERING

1. Understanding the basic structure of an automobile.
2. Evaluating different cooling and lubrication systems of an automobile
3. Analyzing the electrical systems in tandem with ignition systems
4. Understand various transmission and suspension systems.
5. Appraise steering and braking systems. Understand emission norms of automobiles.

MAINTENANCE AND SAFETY ENGINEERING

1. Understand the need for maintenance in an industry and know about Maintenance Management and Control.
2. Appreciate and implement various types of maintenance.
3. Know the concept of inventory control in maintenance.
4. Evaluate the quality and cost of safety and maintenance.
5. Appraise the concepts of reliability and maintainability with reference to the maintenance of equipment.