



GANDHI ACADEMY OF TECHNOLOGY AND ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

Subject: ENGINEERING MECHANICS

- CO₁: Analyze Forces and Moments: Understand and apply principles of static equilibrium to analyze forces and moments acting on structures and systems.
- CO₂: Predict Motion: Analyze and predict the motion of particles and rigid bodies using principles of dynamics and kinematics.
- CO₃: Solve Engineering Problems: Apply mathematical techniques to solve engineering problems related to forces, motion, and equilibrium in various contexts.
- CO₄: Design Simple Structures: Design and analyze simple structures and machine components, considering factors like stress, strain, and material properties.
- CO₅: Apply Vector Mechanics: Use vector mechanics to represent and analyze forces & moments in two and three dimensions.
- CO₆: Understand Material Behavior: Comprehend the behavior of materials under different loading conditions, including stress and deformation analysis.

Subject: BASIC MECHANICAL ENGINEERING

- CO₁: Comprehending the Law of Thermodynamics.
- CO₂: Being aware of how crucial thermodynamics is to IC engines, power plants, refrigerators, and Heat pump.
- CO₃: Being aware of fluid mechanics and heat transfer concepts
- CO₄: Recognizing the functions of engineering materials
- CO₅: Have a fundamental understanding of welding, Casting, Forming and other manufacturing techniques.
- CO₆: Recognizing fundamental power transfer mechanisms and aware of the fundamental robotics system.

Subject: MECHANICS OF SOLID

- CO₁: Determine the stresses, strains and displacements of structures by tensorial and graphical (Mohr's circle) approaches.
- CO₂: Analyze the strength of materials using stress-strain relationships for structural and thermal loading.
- CO₃: Perform basic design of shafts subjected to torsional loading and analyze beams subjected to bending moments.
- CO₄: Determine the deformation of structures subjected to various loading conditions using strain energy methods.
- CO₅: Estimate the strength of thin cylinders, spherical vessel and columns & appreciate the theories of failures and its relevance in mechanical design.
- CO₆: Understand the basic concept of analysis and design of members subjected to Torsion.

Subject: FLUID MECHANICS AND HYDRAULIC MACHINES

- CO₁: Understand the various properties of fluids, their influence on fluid motion and analyze a variety of problems in fluid statics and dynamics.
- CO₂: Calculate the forces that act on submerged planes and curves.
- CO₃: Analyze various types of fluid flows.
- CO₄: Apply the integral forms of the three fundamental laws of fluid mechanics to turbulent and laminar flow through pipes.
- CO₅: Measure the quantities of fluid flowing in pipes, tanks and channels.
- CO₆: Solve kinematic problems such as finding particle paths and streamlines.

Subject: KINEMATICS & DYNAMICS OF MACHINES

- CO₁: Understand fundamentals of simple mechanisms, their inversions and their suitability for Specific outputs.
- CO₂: Analyze position, velocity and acceleration of linkages in mechanisms by graphical and Analytical methods.
- CO₃: Apply fundamentals of gear theory as a prerequisite for gear design.
- CO₄: Estimate various forces and moments acting in reciprocating parts of an engine.
- CO₅: Analyze the effect of friction in mechanical power transmission systems like clutch, belt, Rope and chain drives.
- CO₆: Understand working principles of several types of brakes and dynamometers.

Subject: ENGINEERING THERMODYNAMICS

- CO₁: Understand the concepts of first law of thermodynamics to identify closed and open systems
- CO₂: The concept of second law of thermodynamics to understand fundamental concepts of Unsteady flow, entropy generation and property relations
- CO₃: Develop a fundamental understanding of reversible work, energy balance and second efficiency applied to various real-life applications
- CO₄: Analyze the performance of gas and vapor power cycles and identify methods to improve thermodynamic performance.
- CO₅: Solve problems based on the Brayton cycle, the Brayton cycle with regeneration; & the Brayton cycle with intercooling, reheating, and regeneration.
- CO₆: Explain working principle of air compressors and their applications in engineering industry

Subject: INTRODUCTION TO PHYSICAL METALLURGY AND ENGINEERING MATERIALS

- CO₁: Understand basic structure properties of metals, mechanism of crystallization and imperfection in crystals.
- CO₂: Justify the material behavior and the properties.
- CO₃: Get basic foundation for learning material technology and understand the advances in the material development.
- CO₄: Acquire knowledge on properties and structure offer various non-ferrous alloy and to select suitable material for various engineering applications.
- CO₅: Analyze the various phase transformation in commonly used materials.
- CO₆: Determine the reinforcement content in a polymer composite and analyze its effect on the composites.

Subject: ADVANCE MECHANICS OF SOLIDS

- CO₁: Be able to carry out stress and strain analyses of different load bearing elements and/or constructions
- CO₂: Understand the response of individual elements to the applied loads in both elastic and plastic regime and after unloading
- CO₃: Show knowledge of principal planes, stresses and strains and analyze the elastic deformation of members and apply different theories of elastic failures
- CO₄: Be able to dimension various elements of constructions subjected to a wide range of loading conditions
- CO₅: Compute the deflection of beams and shafts under static loading and stresses in thin walled cylindrical and spherical vessels.
- CO₆: Be able to apply the knowledge on calculation of real constructions.

Subject: MECHANISMS AND MACHINES

- CO₁: Classifying different types of steering mechanism.
- CO₂: Explanation of different follower motion of cam profile.
- CO₃: Design of governor and application in an automobile.
- CO₄: Description of turning moment diagram for flywheel and engine.
- CO₅: Description of balancing concept acting on different types of engines.
- CO₆: Analyzing concepts of Gyroscope and different types of mechanical vibrations.

Subject: BASIC MANUFACTURING PROCESSES

- CO₁: Know the various basic manufacturing processes used in industry for converting raw Materials into finished products.
- CO₂: Apply practical understanding to use different casting methods with their process details, Application and limitations.
- CO₃: Classify & explain in detail different welding methods with their brief introduction about Brazing and soldering
- CO₄: Understand the powder metallurgy process with its typical advantages, limitations and Industrial applications.
- CO₅: Differentiate between various metal forming process such as forging, hot and cold rolling Process.
- CO₆: Learn extrusion process, its types and use of sheet metal in making products.

Subject: HEAT TRANSFER

- CO₁: Remember the concept of different modes of heat transfer
- CO₂: Understand the concept of unsteady state heat conduction
- CO₃: Solve laminar and turbulent condition of external and internal heat flow
- CO₄: Analyze radiative heat transfer in non-absorbing medium
- CO₅: Evaluate the type of condensation using the correlations on various surfaces.
- CO₆: Calculate overall heat transfer coefficient, fouling factor, LMTD and NTU analysis of heat exchanger.

Subject: AUTOMOBILE ENGINEERING

- CO₁: Students get the idea of operational method of different automobile parts at the end of the course.
- CO₂: The differentiation between rear axle and transmission system can be done by students.
- CO₃: Students are able to learn the contour of gears along with theory of various gear boxes.
- CO₄: Describe the necessity of braking system in addition to steering system in automobiles.
- CO₅: Students learn the significance of electrical ignition system in modern automobiles from this course.
- CO₆: Analysis of recent progression in automobiles along with explaining the electronic system used in modern automobile

Subject: DESIGN OF MACHINE ELEMENTS

- CO₁: To understand and apply principles of gear design to spur gears and industrial spur gear boxes.
- CO₂: To become proficient in Design of Helical and Bevel Gear.
- CO₃: To develop capability to analyze Rolling contact bearing and its selection from manufacturer's Catalogue.
- CO₄: To learn a skill to design worm gear box for various industrial applications.
- CO₅: To inculcate an ability to design belt drives and selection of belt, rope and chain drives.
- CO₆: To achieve an expertise in design of Sliding contact bearing in industrial applications

Subject: SMART AND COMPOSITE MATERIALS

- CO₁: Students get the vision and exposure on the newer smart materials.
- CO₂: Identify, describe and evaluate the properties of fibre reinforcements, polymer matrix materials and commercial composites.
- CO₃: Develop competency in one or more common composite manufacturing techniques, and be able to select the appropriate technique for manufacture of fibre-reinforced composite products.
- CO₄: Analyse the elastic properties and simulate the mechanical performance of composite laminates; and understand and predict the failure behaviour of fibre-reinforced composites
- CO₅: Apply knowledge of composite mechanical performance and manufacturing methods to a composites design project
- CO₆: Critique and synthesize the literature and apply the knowledge gained from the course in the design and application of fibre-reinforced composites.

Subject: MACHINING SCIENCE AND TECHNOLOGY

- CO₁: Understand the cutting tool geometry, mechanism of chip formation & mechanics of orthogonal cutting.
- CO₂: Identify basic parts and operations of machine tools including lathe, shaper, planer, drilling, boring, milling and grinding machine.
- CO₃: Understand the importance of non-traditional machining processes and will be able to classify various processes.
- CO₄: Gain thorough knowledge and evaluate tool geometry and tool materials.
- CO₅: Know and appraising about advanced manufacturing processes.
- CO₆: Follow certain advancements of finishing process like honing copying in the field of machining principles and machine tools.

Subject: MICRO ELECTRO-MECHANICAL SYSTEMS

- CO₁: Understand the operation of micro devices, micro systems and their applications.
- CO₂: Apply scaling laws used extensively in the conceptual design of micro devices and systems.
- CO₃: Choose bulk micromachining and surface micromachining for MEMS fabrication process.
- CO₄: Simplify the design of micro devices, micro systems using the MEMS fabrication process.
- CO₅: Acquire scope and recent development of the science and technology of micro and nano systems.
- CO₆: Gain knowledge on underlying the operation principles and design of micro and nano systems.

Subject: PRODUCT DESIGN AND PRODUCTION TOOLING

- CO₁: Describe the characteristics used for product design and development.
- CO₂: Assess the customer requirements in product design.
- CO₃: Apply structural approach to concept generation, selection and testing.
- CO₄: Identify various aspects of design such as industrial design, design for manufacturer, assembly service and quality and product architecture.
- CO₅: Explain various principles and technologies used for preparation of prototypes.
- CO₆: Apply knowledge of production tooling to create efficient and reliable manufacturing set ups.

Subject: REFRIGERATION AND AIR-CONDITIONING

- CO₁: Apply the concepts of thermodynamics to solve problems related to air refrigeration cycles.
- CO₂: Analyze vapor compression refrigeration system and identify methods for performance Improvement.
- CO₃: Study the working principles of vapor absorption and the thermoelectric refrigeration systems.
- CO₄: Present the properties, applications and environmental issues of different refrigerants
- CO₅: Analyze the air conditioning processes using principles of psychometric.
- CO₆: Evaluate cooling and heating loads in an air-conditioning system.