Sardar Patel University, Balaghat (M.P.)

Curriculum

For

Diploma

Mechanical Engineering

From Session: 2024-25

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Subject Name: Material Technology, Subject Code: DME031

Course: Diploma, Branch: Mechanical Engineering, Semester: III

Academic Session: 2024-25

Course Contents

Course Objectives:

To make the understand the materials properties, behavior and different heat treatment process. Application of materials in engineering and real world.

UNIT-I: - General: Brief introduction to the subject metallurgy and its scope in engineering field, classification of materials of industrial importance. Their chemical thermal, electrical, magnetic, mechanical and technological properties and their properties. destructive including Tensile test, compression test, hardness test, impact test fatigue test,

Structure of Metals and Their Deformation: Classification amorphous and crystalline states, unit cells and crystal structure (B.C.C., F.C.C. and H.C.P) allotropy. Crystal imperfection and their effects on properties

UNIT-II: - Solidification of Metal and ingot structure: Process of nucleation and grain growth, ingot solidification, dendritic and columnar structure, segregation of impurities, grain and grain boundaries

Equilibrium Phase Diagrams and Phase Transformation: Equilibrium of phase Diagrams: Plotting of equilibrium diagrams, interpretation, phase rule and lever rule and its application Phase transformations – Eutectic Eutectoid, Peritectic and Peritectoid

UNIT-III: - Iron- Carbon Equilibrium System: The complete iron carbon diagram and its interpretation. The solidification and cooling of various carbon steels,

Heat Treatment of Steels: Objective of heat treatment, thermal processes- annealing, normalizing, hardening and tempering.

Hardening process: Surface hardening, flame hardening, case hardening methods, their scope, limitations and advantages, quenching mediums and their effect on hardness, Hardening defects due to improper quenching, hardenability, Jominy end quench test and interpretation of its results. T.T.T. curves interpretation and use, Isothermal heat treatment processes -martempering, austempering, spherodising and patenting

UNIT-IV: - Ferrous Metals and Alloys: Classification, types of cast irons their properties and uses, alloy cast-irons. Classification, composition and uses of plain carbon steels, Alloy steels - various alloying elements, their effects on properties and uses. Alloy steel classification. Tool Steel: Typical compositions, requirements of tool steels, high speed steel, high carbon steel. Standardization of steels. Designation of steels as per B.I.S. codes.

Non- Ferrous Metals and Alloys: Copper: Its Properties and uses Cooper Bases Alloys: Brasses, their classification, composition, properties and uses, designation of copper alloys as per B.I.S. aluminum its properties and uses.

Aluminum Alloys: Their composition, Classification, properties and uses.

Designation of Al- alloys as per B.I.S, Zinc, Nickel and lead their alloys properties and uses Bearing alloys - their composition and field of application.

UNIT-V: - Non- Metallic Materials: Introduction to Ceramic Refractory, Rubbers Insulators and Lubricants

Plastics: characteristics, classification, commonly used thermo- setting and thermoplastic - their properties and uses. Ingredients for processing plastics. Plastic processing methods different methods.

Powder Metallurgy: Introduction and application. Description of process, manufacture and blending of metal powder compacting and sintering.

Modern Trends in Materials Engineering: New materials like FRP, Composites, synthetic fibers, synthetic wood. Super conductors

List of Experiments

1. To study crystal models for simple cubic, BCC, FCC and HCP Structures.
2. To study the Microstructures of cast iron.
3. To find out the hardness of various treated and untreated plain carbon steels.
4. To study thermo-setting of plastics.
5. To study the properties of various types of plastics.
6. To study crystal structures and crystal imperfections using ball models.

Reference Books:

- Engineering physical Metallurgy-By Prof. Y Lakhtin MIR Publishers mascow
- A Text Book of Material Science and Metallurgy by O.P. Khanna.
- Material Science and Process. by S. K. Hazia Choudhry
- Mechanical Metallurgy by Dieter (Tata McGraw-Hill)
- Materials For Engineers by M.H.A. Kempsty
- Introduction to Material Science and Engineering by K.M. Ralls, T.H. Courtney, John Wuff (Wiley Eastern New Delhi)

Course Outcomes:

1. Demonstrate an understanding of the classification, properties, and industrial applications of various materials.
2. Analyze the structure of metals and crystal imperfections, applying this knowledge to predict and improve material performance in engineering tasks.
3. Evaluate modern materials, including non-ferrous alloys, ceramics, and composites, and integrate emerging material technologies into engineering solutions.

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Subject Name: Manufacturing Processes, Subject Code: DME032

Course: Diploma, Branch: Mechanical Engineering, Semester: III

Course Contents:

Course Objectives:

1. To define and describe the standards of measurements. and relate the significance of various instruments with their particular practical applications
2. To demonstrate ability of applying the theoretical knowledge of tool geometry, tool materials and cutting fluids
3. To recognize basic theory and terminologies of pattern making and classification of molding and casting processes.
4. To explain the welding process and its classification in detail. & describe and explain gas cutting and metal forming process.

UNIT-I: - Introduction to Manufacturing Processes: Classification and elementary idea of metal forming processes on the basis of the properties of deformability, Definition, Classification of basic manufacturing processes i.e., Mechanical working, Casting, Metal joining processes, Metal cutting process, Press working.

UNIT-II: - Metal Joining, Welding: Weld edge preparation, Introduction to various welding processes with procedure equipment and applications such as Electric arc welding. Resistance welding, Spot welding, Flash butt, Percussion welding. Thermit welding. Gas welding and gas cutting: Principle of operation and technique, gas cutting.

UNIT-III: - Mechanical Working: Introduction - hot and cold working Principle of recrystallization.

Metal Rolling: Principle of metal rolling, basic components of a simple rolling process equipment. Types of deformation during rolling. roller material, selection and desirable properties, principles of thread rolling- description with sketches, manufacture of seamless tubes by rolling. types of rolling mill. Rolling defects.

Metal Drawing: Basic Principle of drawing of metals, differentiate between the drawing and deep drawing of metals, principle of wire drawing and example.

Extrusion: Definition, Classify the methods of extrusion, their limitations, advantage and disadvantage. Tube extrusion, impact extrusion, application of extrusion processes. Extrusion defects.

Forging: Types of forging, die forging, differentiate between the cold die and hot die forging, advantage of forming by forging, common defects and their reasons. Limitations of forging, press forging, drop forging, upset forging, die material, applications of forging processes in engineering.

UNIT-IV: - Metal Casting: Introduction, advantages and limitations of casting as production process.

Pattern Making: Definition of pattern, types of patterns and their details, materials, allowances, tools required, colour code for patterns.

Moulding: Definition, moulding methods and types of moulds, moulding materials, moulding sand and its composition, sand properties, testing parameters of sand, and their effects, sand preparations, sand conditioning, characteristics and defects of moulds. Function of runners, risers and gate.

Furnaces: Cupola, crucible, pit and electric arc furnaces, induction furnace, their salient features, safety aspects.

UNIT-V: - Press Working: Introduction of press working of metals, principle of press working, description of a simple press working unit, press working operations: punching, shearing, drawing, bending, slitting, knurling, notching, trimming, piercing etc.

Double action press, description and its field of application, die and punch, types of dies, specifications of a press, safety precautions to be observed while working on a press.

List of Experiments

1. Making a split/solid pattern from wood. Making a core box.
2. Tempering of sand, practice of green and dry sand making
3. Practice of core making and baking
4. Practice of open mould in two boxes, using split pattern and solid pattern, locating the core.
5. Demonstration of metal melting in pit furnace& casting process.
6. Simple forming practice (Making a square bar out of a given round bar, making of a chisel and bolt)
7. Practice of upsetting of a round on power hammer.
8. Practice of sheet cutting with the help of straight and bent snips. Making small rectangular prism and cylinder.
9. Demonstration and practice of bead laying (Welding) on a Flat pieces
10. Welding ' V' butt joint.

Reference Books:

- Process and Materials of Manufacture by Lindberg.
- Workshop Technology by Hazara & Choudhary.
- Materials And Manufacturing processes by Dalela.
- Manufacturing Processes by Yankee.
- Manufacturing Process by S.E. Rusinof
- Welding Engineering by B.E. Rossi.
- Production Engineering – P.C. Sharma

Course Outcomes:

1. Understand and classify fundamental manufacturing processes like forming, joining, casting, and cutting.
2. Demonstrate knowledge of welding techniques, equipment, and safety practices.
3. Analyze mechanical working processes including rolling, drawing, extrusion, and forging.
4. Identify and troubleshoot metal casting processes and defects.
5. Explain press working operations and safety precautions in press work.

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering and Technology

Syllabus

Subject Name: Thermal Engineering – I, Subject Code: DME033

Course: Diploma, Branch: Mechanical Engineering, Semester: III

Course Contents

Course Objectives:

1. Demonstrate the supercritical steam generator system and able resolve the problem related with efficiency and Heat balance sheet of the steam generator
2. Understand the basic ideas of steam power plant and to solve the steam power plant complex problems.,
3. Analyze basic concept of gas dynamic problem, able to identify the various parameter of gas dynamic that involves in the topic and to setup mathematical model by utilizing the engineering knowledge.
4. Competent of basic engineering involve in air compressor and capable of setting up mathematical models using engineering knowledge and solutions for reciprocating air compressor problems.

UNIT-I: - Dimensions and systems of units: Basic and Derived units for common engineering variables and properties like mass, length, time, temperature, area, volume, velocity, acceleration, force, pressure, work, heat, energy, power etc.

Sources of energy: Brief description of energy sources Classification of energy sources, Renewable, Non-Renewable, Fossil fuels, including CNG, LPG; Solar Energy- Its nature, merits and demerits, potential; Flat plate and concentrating collectors & their application. Solar Water Heater, Solar Air Heater, Photovoltaic Cell, Solar Distillation; Wind, Tidal, Geothermal, Biogas, Biomass, Bio-diesel, Hydraulic, Nuclear, Fuel cell – list of fuel cells.

UNIT-II: - Basic Concepts of thermodynamics: Definition and importance of thermodynamics, thermodynamic system open, closed and Isolated system, boundary and surrounding forms of energy. Point and path functions, properties of system intensive and extensive properties thermodynamic state, thermodynamic process, cycles thermodynamic definition of work, heat and thermodynamic equilibrium, zeroth law of thermodynamics, Quasi-static process, work done during Quasi Static process.

UNIT-III: - First Law of Thermodynamics: - Concept of heat reservoir, heat source and heat sink, Statement of first law, Mathematical representation, applications of first law to open and closed system. Concept of internal energy and its calculation, relationship between heat transfer, work transfer and change in internal energy. Differentiation between shaft work, flow work and displacement work; Steady flow energy equation and its application to various units such as boiler, nozzle, turbine compressor enthalpy.

UNIT-IV: -Second Law of Thermodynamics: Limitation of first law. Statements of second law Kelvin, Planck and Clausius statements, Concept of heat pump, refrigerator and heat engine thermal efficiency. Parameters affecting thermal efficiency, means of increasing efficiency, COP. Equivalence and irreversible processes. Factors which make a process irreversible. Reversible cycle. Carnot cycle its efficiency and limitation; Carnot theorem Clausius Inequality, concept of entropy, Principle of increase of entropy, determination of increase of entropy, principle of increase of entropy, determination of increase of entropy, Statement of third law of thermodynamics

UNIT-V: - Ideal Gases and Gas Processes: Definition of an ideal gas, gas law, characteristics gas equation, specific and universal gas constants specific heat constant pressure and specific heat, constant volume. Ideal gas processes- isobaric isothermal, isentropic, polytropic and throttling process as applied to open and closed systems. Representation of these processes on P-V, T-S and H-S diagrams. Computation of change in enthalpy, entropy and internal energy. Net heat transfer and work done.

List of Experiment:

1. Study and trial on solar water heating system
2. Report on visit to wind power generation plant / biogas plant / hydraulic powerplant.
3. Trace the flue gas path and water-steam circuit with the help of boiler model and write a report.
4. Study or Report on visit to sugar factory/Dairy/steam power plant with specifications of boiler and list of mountings and accessories.
5. Study of separating and throttling calorimeter.
6. Study of steam turbine.
7. Study of different types of I.C. engines (four stroke and two stroke C.I. and S.I.)

Reference Books:

- Engineering Thermodynamics by P.K. Nag, Tata McGraw-Hill td.
- Engineering Thermodynamics, C.P. Gupta, Rajendra Prakash
- Thermal Engineering by P. L. Ballaney. (Khanna Publisher's N. Delhi)
- A Course in thermodynamics And Heat Engines by Kothanandran, Khajuria and Arora (Dhanpat Rai & Sons Delhi)
- Treatise On Heat Engineering by Vasandani & Kumar (Metropolitan Book Co. Ltd, New Delhi)
- Thermodynamics by G.T. Van Wylen (John Wiley & Sons)

Course Outcomes:

1. Identify basic and derived units for engineering properties and classify energy sources.
2. Analyze energy interactions in open and closed systems using the first law.
3. Evaluate thermal efficiency, irreversibility, and entropy changes in thermodynamic cycles.

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering & Technology

Syllabus

Subject: Mechanical Drafting & AutoCAD, Subject Code: DME034

Course: Diploma, Branch: Mechanical Engineering, Semester: III

Course Contents

Course Objectives:

1. To apply the concepts of geometric dimensioning and tolerancing (GD&T) for creating and interpreting manufacturing and assembly drawings.
2. Student will be able to Draw various types of drawing on AutoCAD.
3. Student will be able to Draw any 2D view of the object.
4. Student will be able to Draw any 3D view of the object.

UNIT-I: - Projection and multi view Representation: Projection orthographic projection. First and third angle projection, superfluous view, choice of views, auxiliary views- views -full and partial, conversion of pictorial views in to orthographic views, conventional representation as per IS: 692 (1989).

Sectional Views: Full section, half section, partial or broken section, revolved section, removed section, offset section. Sectioning conventions, section lines. Hatching procedure for different materials as per IS code 686 (1985). Sectional views of assembled parts. Choosing from IC engine parts, couplings, clutches, brackets, bearing etc. (Use 1st and 3rd angle projections both)

UNIT-II: - Dimensioning Tolerance, Machining and Welding Symbols: Types of dimensions (size and location) dimensioning terms and notations. (Use of I.S. Code 696 & 2709) general rules for dimensioning and practical hints on dimensioning systems of dimensioning. Dimension of cylinder holes arcs of circle narrow space, angles, counter sunk hole, screw threads taper etc. Application of tolerances. (Use I.S. Code 696) Machining marks, finish marks, countersinking, counter boring spot facing, figures and notes for same. Representation of characteristics machining (circularity, Angularity etc.) (Ref IS 969) Representation of welded joints, welding symbols, tolerance of forms and positions. Procedure of drawing fits, limits, size, tolerance, clearance etc.

UNIT-III: - Production Drawing: Detailed drawing, assembly drawing, scale, finish tolerances, notes etc. Title block, tool list, gauge list. Preparation of production drawing for pattern shop. Forging shop, machine shop, preparation of assembly drawing from detailed drawing. exploded views, sectional pictorial views, assembly drawing of nut and bolt, Plummer block, flange coupling, stepped pulleys, foot-step bearing, Universal coupling, connecting rod, piston of I.C. engines, cotter joint, Knuckle joint. Preparation of detailed drawing from assembly drawings and assembled pictorial views, Interpretation of production drawing.

UNIT-IV: - Introduction to Auto CAD: Coordinate system. Draw command- line, arc, circle rectangle, polygon, point, ellipse, hatch, table. Modify commands-erase, copy, offset, array, trim, extend, break, join, chamfer, fillet, move, rotate, scale, stretch, lengthen. Dimensioning. Tray settings: snap, grid, ortho, polar, snap
Format commands: line type, point style, units, layers, drawing limit, dimension style
Application of Auto CAD: practice of assembly drawings using Auto CAD

UNIT-V: - Presentation: Block, creating layout, insert layout, plotting/printing
Pipe Drafting: Various symbols used in pipe line work as per IS code of Practice, C.I. flanged joint, socket and spigot joint, gland and stuffing box, expansion joint, pipe fitting typical pipe bends, pipe supports and accessories.
Gear Drawing: Gear terminology such as pitch, pitch circle diameter module, addendum, root circle diameter, hole depth, blank diameter etc. construction of cycloidal, involute teeth profiles, pinion and rack mashing, spur gear mashing.

Suggested Term –Work

1. Projection and multi views representation
2. Sectional views
3. Production drawing
4. Dimensioning, symbols tolerance, machining and welding
5. Pipe drafting
6. Gear Drawing
7. Graphs and charts
8. Computer graphics

Reference Books:

- Fundamentals of Engineering Drawing by Warren J. Luzadder (Prentice-Hall).
- Mechanical Drawing by Giesecke, Michell Specer, Hill. (Collier Macmillan Internal Edition)
- Engineering Graphics by Giesecke/Mitchell/ Spencer/ Hill/ Loving (Macmillan).
- Mechanical Drawing by N.D. Bhatt
- Mechanical Drawing by P.S. Gill
- Mechanical Drawing by R.K. Dhawan
- Inside AUTO CAD by Daniel Raker and Harbest Rice (BPB Publisher)
- Computer Graphics and CAD Fundamentals by Noel M Morries (Wheeler)

Course Outcomes:

1. Create orthographic and sectional views based on first and third angle projections, following IS codes.
2. Apply dimensioning and tolerancing standards.
3. Apply AutoCAD commands to create, modify, and dimension mechanical parts and assemblies.
4. Represent pipe fittings, joints, and gear profiles using standardized drafting conventions.

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering & Technology

Syllabus

Subject: Strength Of Material, Subject Code: DME035

Course: Diploma, Branch: Mechanical Engineering, Semester: III

Course Contents

Course Objectives:

1. Understand properties of materials.
2. Demonstrate the concept and laws applied to member under various loading condition.
3. Analyze and design structural members subjected to torsion, compression, bending and combined stresses using fundamental concepts of stress, strain and elastic behaviors of materials
4. Analyze beams, shaft, column and pressure vessel under various loading conditions.

UNIT-I: - Simple Stress and Strains: Introduction types of loads and deformation, types of stresses and strain. Hooke's law, stress strain diagram for ferrous and non-ferrous materials modulus of elasticity. rigidity and bulk modules of materials Stress in bars of varying cross sections, composite sections and compound sections Thermal stresses and strains, thermal stresses in composite sections. Poisson's ratio, volumetric strain, relation between different modulus, strain energy, resilience, proof resilience, modules of resilience suddenly applied loads and impact loads.

Mechanical properties and their testing: Mechanical properties of materials, destructive including Tensile test, compression test, hardness test, torsion test, impact test fatigue test, endurance limit, bending test, shear test and non- destructive testing methods.

UNIT-II: - S.F. and B.M. Diagrams: Definition, types of loading types of beams, shear force and bending moment sign conventions S.F. and B.M. diagrams for cantilever simply supported and overhanging beams with point or concentrated loads uniformly distributed loads and combination of point and U.D.L. Point of contra flexure, numerical problems.

Principal Planes and Principal Stresses: Stresses on inclined plane subjected to direct shear or combination of stresses in two mutually perpendicular planes. Principal planes and principal stresses, analytical and graphical methods.

UNIT-III: - Bending Stresses in Beams: Theory of simple bending as assumptions made in simple bending theory position of neutral axis, surface moment or resistance. Modules of section of symmetrical sections such as rectangular, circular and I-sections, bending stresses in symmetrical sections. Simple problems. Reinforced concrete beams, beam of uniform strength.

Shear Stresses in Beams: Introduction shear stress equation, assumptions made, distribution of shear stresses over various sections, such as rectangular, circular and I L & T sections, Simple numerical problems.

Deflection of Beams: Introduction Strength and stiffness of beam curvature of bent beam, Derivation of equation for slope and deflection of beam in case of cantilever and simply

supported beam loaded with point loads U.D.L. and combination. Simple numerical problems. Importance of deflection and practical applications.

UNIT-IV: - Torsion of Shaft: Definition of torsion relation between stress, strain and angle of twist assumptions made strength of solid and hollow circular shaft, polar moment of inertia. Calculation of shaft diameter on the basis of strength and stiffness for the given horse power transmitted torsional rigidity. Maximum torque comparison of solid and hollow shaft size of a shaft for a given torque.
Spring: Definition types and use of springs, leaf spring, helical and spiral springs, Stiffness of a spring and maximum shear stress, defection of spring. Spring Classification based on size shape and load.

UNIT-V: - Columns and struts: Definitions crippling load different end conditions, slenderness ratio, equivalent length, Euler's theory Rankine's formulae, radius of gyration, Rankine constant for different materials Limitations of Rankine formula simple problem B.I.S. code for columns.
Stresses in Frames: Definition of frame, perfect, deficient and redundant frame. Assumptions made in finding stress in method of sections and graphical method Bows notation, solution of problems using three methods.
Thin Cylinders and Spheres: Hoop stress longitudinal stress on inclined plane subject subjected to direct, shell, volume strain change in value, cylindrical vessels subjected to internal pressure, simple numerical problems.

List of Experiments:

1. Tension Test on mild steel, Aluminum & compression test on cast iron on Universal Testing Machine.
2. Direct Shear Test of mild steel on Universal Testing Machine
3. Brinell Hardness Test of Mild Steel specimen.
4. Rockwell hardness Test of specimen.
5. Izod & Charpy - Impact tests of a standard specimen.
6. Torsion Test on Mild steel bar using tensional testing machine.
7. Drawing sheet on shear force & bending Moment diagrams for a given loading (At least four problems.).
8. Estimation of principal stresses and maximum shear strain for a given combined loading by analytical & Mohr’s circle method. (At least two problems.).
9. Fatigue test on any given ductile material

Reference Books:

- Beer FP, Johnson ER, Dewolf JT: Mechanics of Materials; TMH
- Rattan; Strength of materials; TMH
- Nash William; Schaum’s Outline Series; Strength of Materials; TMH.
- Negi; strength of materials; TMH
- Singh Arbind K; Mechanics of Solids; PHI
- Sadhu Singh; Strength of Materials; Khanna Pub.
- Kamal K and Ghai RC; Advanced Mechanics of Materials; Khanna Pub.

Course Outcomes:

1. Analyze different types of stresses, strains, and mechanical properties of materials, including testing methods.
2. Apply the theory of simple bending and shear stress distribution for symmetrical sections.
3. Create shear force and bending moment diagrams for various beam configurations under different loading conditions.
4. Evaluate torsional stresses in solid and hollow shafts and understand spring mechanics.
5. Compute loads on columns using Euler's and Rankine's theories and solve problems related to stresses in thin cylinders and frames.

SARDAR PATEL UNIVERSITY, BALAGHAT (MP)

School of Engineering & Technology

Syllabus

Subject: AutoCAD Lab, Subject Code: DME036P

Course: Diploma, Branch: Mechanical Engineering, Semester: III

Course Contents

Course Objectives:

1. To provide hands-on experience with industry-standard CAD software.
2. To develop skills in 2D and 3D modeling, assembly, and simulation.
3. To enable students to create detailed engineering drawings and documentation.
4. To bridge the gap between theoretical knowledge and practical application in design and manufacturing.

Unit-I

Introduction to CAD Software: Introduction to the CAD interface, navigation, and basic commands. Setting up projects: Units, grids, layers, and views. Simple 2D sketching exercises.

2D Drafting and Documentation: Creating detailed 2D drawings from hand sketches. Dimensioning, tolerancing, and annotations. Generating views: Orthographic, isometric, section, and auxiliary views. Introduction to GD&T (Geometric Dimensioning and Tolerancing).

Unit-II

3D Modeling Basics: Basics of 3D modeling: Extrude, revolve, sweep, and loft. Parametric modeling concepts. Practice with simple 3D parts: Brackets, gears, and enclosures. Feature-based modeling: Fillets, chamfers, holes, and patterns.

Advanced 3D Modeling: Advanced features: Shell, rib, draft, and complex sweeps. Surface modeling: Creating and editing complex surfaces. Introduction to reverse engineering: Converting scanned data to 3D models. Exercises on complex 3D assemblies with multiple components.

Unit-III

Assembly Modeling: Introduction to assembly modeling: Mates, constraints, and motion studies. Designing mechanical assemblies: Gears, couplings, and linkages. Interference and collision detection in assemblies. Generating exploded views and assembly drawings.

Simulation and Analysis: Basics of Finite Element Analysis (FEA): Stress, strain, and deformation. Static analysis on simple components. Motion analysis and kinematic simulations in assemblies. Introduction to Computational Fluid Dynamics (CFD) in CAD environments.

Unit-IV

Design Optimization and Parametric Studies: Introduction to design optimization techniques. Parametric studies: Varying dimensions and analyzing results. Case studies on optimizing designs for weight, strength, and manufacturability. Introduction to generative design and topology optimization.

Unit-V

Project Work and Presentations: Students will undertake a mini-project involving the complete design process: Concept, modeling, assembly, analysis, and documentation. Final presentation and viva on the project, demonstrating the application of CAD tools will be done before final examination.

Reference Books:

- Engineering Design with SolidWorks by David C. Planchard Publisher: SDC Publications
- Mastering AutoCAD 2021 and AutoCAD LT 2021 by Brian C. Benton Publisher: Sybex
- Pro/ENGINEER Wildfire 5.0 by Louis Lamit Publisher: McGraw-Hill Education
- Siemens NX for Designers by Sham Tickoo Publisher: CADCIM Technologies
- Introduction to CATIA V5 Release 21 by Kirstie Plantenberg Publisher: SDC Publications
- Finite Element Analysis for Engineers by Frank L. Stasa Publisher: Butterworth-Heinemann
- ANSYS Workbench 2021 R2: A Tutorial Approach by Prof. Sham Tickoo Publisher: CADCIM Technologies
- Autodesk Fusion 360: A Power Guide for Beginners and Intermediate Users by Sandeep Dogra Publisher: CAD Artifex
- Geometric Dimensioning and Tolerancing for Mechanical Design by Gene R. Cogorno Publisher: McGraw-Hill Education
- 3D Printing and Additive Manufacturing: Principles and Applications by Chee Kai Chua and Kah Fai Leong Publisher: World Scientific Publishing.

Course Outcomes:

1. Proficiency in using CAD tools for creating detailed 2D and 3D models.
2. Ability to design complex assemblies and perform basic simulations.
3. Competence in creating technical drawings adhering to industry standards.
4. Understanding of product lifecycle management (PLM) tools and their integration with CAD systems.