Program Educational Objective (PEO)

PEO 1 : To prepare the students to take-up career in different industries or to pursue higher studies in mechanical and interdisciplinary programs. (Preparation)

PEO 2 : Be competent with strong technological background to analyze data, formulate and undertake industrial problems and obtain viable solutions. (Core Competence

PEO 3 : To prepare students with engineering breadth to innovate, create and design novel systems and to contribute in providing solutions to real-life problems. (Breadth)

PEO 4 : Be Competent for effective communication, in management and in professional skills and ethics. (Professionalism)

PEO 4 : To provide opportunity to the students to expand their horizon beyond mechanical engineering which enable them to understand the significance of life-long learning in global perspective (Learning Environment).

Program Outcomes (UG)

PO1 : Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO2 : Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO3 : Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO4 : Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO5 : Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO6 : The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO7 : Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO8 : Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9 : Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10 : Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11 : Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies

Program Specific Outcomes (UG)

PSO1 : Application of Mechanical Engineering Principles:

Graduates will be able to apply the principles of thermal, fluid, material science and manufacturing processes to solve real-world engineering problems.

PSO2 : **Design and Operating Skills:**
Graduates will be able to design and operate mechanical systems and analyze their performance using industry-standard tools and techniques.

Course Outcomes (UG)

Sem	Type	Sub. Code	Subject	CO	CO STATEMENTS
1	BES	23GE1102	Differential Equations, Matrices and Statistics	1	Solve first order and higher order differential equations to find the solution of engineering and real life problems.
				2	Apply the knowledge of partial differential equations to find the solution of engineering and real life problems.
				3	Determine the rank of a matrix, eigenvalues and eigenvectors and its utilization in solving Engineering problems.
				4	Construct best-fit curves and find the correlation and regression between variables.
1	BES	23GE1108	Engineering Physics	1	Apply the fundamentals of quantum mechanics to identify and analyze problems dealing with quantum particles.
				2	Explain the characteristics of semiconductor materials for analyzing the problems based on crystal structures, charge carriers, energy bands and their applications in emerging technologies.
				3	Assess the intensity variation of light due to interference, diffraction, laser exploring their potential applications.
				4	Analyze the motion of charged particles in electric and magnetic field assessing their application to electron optic devices.
					Illustrate the nature and characterization of magnetic materials and superconductors for analyzing the engineering applications.
1	BES	23GE1109	Lab: Engineering Physics	1	Understand the basic concepts and physical laws through experiments.
				2	Utilize experimental techniques to process data and draw valid conclusions.
				3	Apply experimental results to maintain accurate records and communicate findings effectively through verbal skills.
				4	Analyze results from experiments to nurture lifelong learning.
Sem	Type	Sub. Code	Subject	CO	CO STATEMENTS
1	BES	23ME1101	Engineering Graphics	1	Apply visualization practices to draw orthographic drawing and isometric drawing of a given object

				2	Construct Projections of various One Dimensional, Two dimensional, three Dimensional objects.
				3	Develop the lateral surfaces of cut section of different geometrical solids.
				4	Draw 1D, 2D and 3D drawing using computer aided drafting tool.
1	BES	23ME1102	Lab : Engineering Graphics	1	Apply visualization practices to draw orthographic drawing and isometric drawing of a given object
				2	Construct Projections of various One Dimensional, Two dimensional, three Dimensional objects.
				3	Develop the lateral surfaces of cut section of different geometrical solids.
				4	Draw 1D, 2D and 3D drawing using computer aided drafting tool.
1	BES	23EL1101	Basic Electrical and Electronics Engineering	1	Discuss electric circuits for voltage, current and power etc.
				2	Describe construction, working principal and its types and uses of different electrical machinery
				3	Explain the working principles, characteristics, and applications of electronic circuits.
				4	Illustrate measurement systems, characteristics, and error analysis.
1	BES	23ME1107	Lab : FAB Shop	1	Interpret the general safety/Precautions on shop floor, identify and use the different Materials, machines and measuring and cuttings tools.
				2	Practice on Manufacturing of components using workshop trades including fitting, plumbing, carpentry, smithy/foundry and welding, etc.
				3	Demonstrate practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes
				4	Produce simple/small product of their intrest in project/product development or research purpose
1	BES	23ME1105	Material Science & Metallurgy	1	Distinguish microstructure and Apply the effect of Crystalline nature of Metals
				2	Differentiate Iron-Iron Carbide equilibrium diagram and Analyse Microstructure, general properties of commercial steels and cast Iron
				3	Identify Various heat treatment processes for material
				4	Apply the basics of powder Metallurgy for powder metallurgical components.
Sem	**Type**	**Sub. Code**	**Subject**	**CO**	**CO STATEMENTS**
1	BES	23ME1106	Lab : Material Science & Metallur...	1	Examine microstructure, General properties of commercial steels and cast-iron

				2	Interpret various heat tratment processes for material
				3	analyse quenching mechanisms and their imact on the microstructure and hardness of metals
				4	develop skills in documentation, technical communication, ethics and safety practices
1	BES	22ME105	Engineering Graphics	1	Apply visualization practices to draw orthographic drawing and isometric drawing of a given object.
				2	Construct projections of various One Dimensional, Two dimensional, and three Dimensional object
				3	Develop the lateral surfaces of the cut section of different geometrical solids.
				4	Draw 1D, 2D and 3D drawing using computer aided drafting tools.
1	BES	22ME106	Lab: Engineering Graphics	1	Apply visualization practices to draw orthographic drawing and isometric drawing of a given object.
				2	Construct projections of various One Dimensional, Two dimensional, and three Dimensional object
				3	Develop the lateral surfaces of the cut section of different geometrical solids.
				4	Draw 1D, 2D and 3D drawing using computer aided drafting tools.
1	BES	23ME1105	MSM	1	Distinguish microstructure and Apply the effect of Crystalline nature of metals.
				2	Differentiate Iron-Iron carbide equilibrium diagram and Analyse microstructure, general properties of commercial steels and Cast Iron.
				3	Identify various heat treatment processes for material
				4	Apply the basics of powder Metallurgy for powder metallurgical components
1	BES	23ME110	MSM- LAB	1	CO-1 :- Examine microstructure, general properties of commercial steels and Cast Iron.
				2	CO-2 :- Interpret various heat treatment processes for material.
				3	CO-3 :- .Analyse quenching mechanisms and their impact on the microstructure and hardness of metals.
				4	CO-4 :- Develop Skills in Documentation, Technical Communication, Ethics, and Safety Practices.
Sem	**Type**	**Sub. Code**	**Subject**	**CO**	**CO STATEMENTS**
2	BS	23GE1201	Calculus and Vector	1	Apply the knowledge of nth derivative of product of two functions and expansion of functions in engineering problems.

				2	Determine the derivatives of functions of several variables and find the relations among the functions.
				3	Evaluate the single and multiple integrals to find area, volume, mass and center of gravity.
				4	Utilize the knowledge of vector calculus and select appropriate theorem to solve Engineering problems.
2	BS	23GE1204	Applied Chemistry	1	Build the knowledge of qualitative and quantitative aspects of water for industrial and domestic applications.
				2	Apply fundamental principles of electrochemistry to understand corrosion, energy storage devices and their industrial applications.
				3	Develop insight into engineering materials for industrial applications.
				4	Utilize knowledge of advanced engineering materials for technological applications.
2	BS	23GE1205	Lab: Applied Chemistry	1	Understand quantitative and qualitative chemical analysis to perform, record and analyze the results.
				2	Experiment with instrumental and analytical techniques in Chemistry to solve engineering problems related to sustainability.
				3	Apply laboratory safety protocols and procedures to acquire the ability for independent and lifelong learning.
				4	Analyze the experimental data to write effective reports and communicate through oral presentations.
2	BS	23GE1212	Professional Communication	1	Identify the fundamental components of Indian civilization, including its historical, cultural, literary, artistic, and architectural contributions.
				2	Describe the technological, cultural, and spiritual advancements in early Indian civilization, specifically during the Stone Age, Indus Valley, and Vedic period.
				3	Illustrate the structure and aspects of Indian society and lifestyle, including social types, traits, and traditional practices.
				4	Apply knowledge of Indian traditional art and architecture to interpret examples of painting, sculpture, and town planning.
2	BS	23GE1215	Indian Knowledge System	1	Recognize the fundamental components of Indian civilization, including its historical, cultural, literary, artistic, and architectural contributions.
				2	Describe the technological, cultural, and spiritual advancements in early human civilization that laid the foundation for organized societies,
				3	Illustrate the knowledge of Indian traditional art, painting, and pastime through their cultural significance, regional diversity, and symbolic value.
				4	Apply the principles of Indic tradition related to mathematics, architecture, design, and town planning, emphasizing the integration of ancient wisdom with contemporary practices.
Sem	Type	Sub. Code	Subject	CO	CO STATEMENTS
2	BS	23CV1201	Engineering Mechanics	1	Analyze and determine the resultant of a system of forces and moments in planar force systems.

				2	Apply the conditions of equilibrium to solve problems related to planar force systems.
				3	Calculate and evaluate the centroid and moment of inertia for composite areas, using transfer formulas
				4	Apply the principles of virtual work, kinetic energy, impulse momentum, and work-energy methods to solve dynamics problems.
2	BS	23CV1202 Lab:	Engineering Mechanics	1	Understand and analyze the support reactions and force distribution in structure like beams and trusses through experimental and graphical methods.
				2	Apply principles of friction to evaluate coefficients of friction for different surfaces and apparatus like Plane Friction and Coil Friction setups
				3	Evaluate the efficiency and mechanical advantages of machines such as Differential Axle & Wheel, Single Purchase Crab, and Double Purchase Crab machines
				4	Analyze the moment of inertia for composite figures using Mohr's circle and hand calculations.
2	BS	23IT1203	Programming for Problem Solving	1	Describe the fundamental concepts of computer systems and develop a solid foundation in programming principles using the C language.
				2	Develop solutions using programming concepts including data types, operators, expressions, decision-making, and loop control structures.
				3	Apply 'C' programming concept for solving real life problems.
				4	Analyze and manage structured data effectively to develop logical and efficient solutions using fundamental C programming concepts.
2	BS	23IT1204	Lab: Programming for Problem Solving	1	Develop the ability to formulate and implement solutions to complex engineering problems through the application of foundational C programming techniques and elementary mathematical knowledge.
				2	Identify and apply appropriate C programming constructs for developing efficient solutions to computational problems.
				3	Analyze data processing operations using loops, functions and arrays for problem-solving tasks such as searching techniques and matrix manipulations.
				4	Identify and fix the bugs in the C program
3	HSSM-1	23GE1301	Fundamentals of Management & Economics	1	Apply fundamental principles of management, leadership, and motivation to perform core managerial functions for effective resource utilization.
				2	Implement basic concepts of marketing and financial management to prepare accounting records and design marketing strategies for business decision-making
				3	Analyze microeconomic variables like demand, utility, and market structure to assess the behavior of individuals and firms in diverse economic scenarios.
				4	Evaluate macroeconomic indicators and fiscal tools to interpret national economic performance and develop solutions for organizational economic challenges.
Sem	Type	Sub. Code	Subject	CO	CO STATEMENTS
3	VEC-II	23ME1301	Computer Aided Design	1	Describe the fundamental concepts of CAD tools.

				2	**Apply the basic concepts of 2D and 3D transformation for solving engineering problems.**
				3	**Analyze the importance of computer graphics for plotting curves.**
				4	**Evaluate the use of different data exchange formats as per the applications.**
3	PC	23ME1303	Manufacturing Processes	1	**CO-1:- The student will be able to illustrate the basics of molding process and compare various casting processes**
				2	**CO2 The student will be able to analyze various Forming and sheet metal working processes**
				3	**The student will be able to Elaborate and classify different welding Processes.**
				4	**The student will be able to discuss and analyze unconventional machining Processes.**
3	PC	23ME1304	LAB: Manufacturing Processes	1	**The student will be able to illustrate the basics of moulding practices and various casting process .**
				2	**The student will be able to illustrate CUPOLA and other furnaces.**
				3	**The student will be able to Elaborate and classify different welding processes.**
				4	**The students will able to discuss smw process**
3	PC	23ME1305	Mechanics of Materials	1	**Apply the basic concepts of stress, strain and their variations under different types of loading to calculate Stresses.**
				2	**Construct bending moment, shear force diagram for statically determinate beams and determine stress distribution.**
				3	**Compute slope and deflection in statically determinate beam and calculate strain energy under varying load conditions.**
				4	**Evaluate the torsional shear stress in the shaft and examine the buckling load in columns**
3	PC	23ME1306	LAB:- Mechanics of Materials	1	**CO1: Evaluate axial stresses in Material experimentally to calculate material strength.**
				2	**CO2: Calculate bending and shear stresses in Material**
				3	**CO3: Calculate hardness, spring stiffness and strain energy of the material**
				4	**CO4: Develop Skills in Documentation, Technical Communication, Ethics, and Safety Practices**
Sem	**Type**	**Sub. Code**	**Subject**	**CO**	**CO STATEMENTS**
3	PC	23ME1307	Kinematics of Machineries	1	**CO-1:- 1. Intrepret the various kinematic concepts in different mechanisms.**

				2	CO-2:- 2. Analyze the velocity and acceleration of links at any point in various mechanisms.
				3	CO-3:- 3. Construct the various cam profiles manually in accordance to the follower motion
				4	CO-4:- 4. Solve the problems related to gear and gear trains
4	BS	23GE1402	Integral Transform	1	Identify Laplace transform & Inverse Laplace Transform of standard function and their properties and solve Ordinary differential equation.
				2	Make use of Z-Transform and its properties to solve the discrete mathematical equations.
				3	Develop a Fourier series of periodic functions for a finite range in terms of Sine and cosine.
				4	Apply Fourier Integral formulae to evaluate various integrals and determine Fourier Transforms of various functions
4	HSSM-2	23GE1401	Entrepreneurship Development	1	Assess the fundamental concepts of entrepreneurship, and identify the key functions, types, and stages in the entrepreneurial process.
				2	Explain incorporation processes and legal compliance to manage a start-up effectively.
				3	Analyse the importance of intellectual property rights and strategies in entrepreneurship.
				4	Identify the system of support which helps to grow the entrepreneurship.
4	PC	23ME1401	Machining Processes	1	The student will be able to Demonstrate the cutting tool geometry of SPCT, mechanism of chip formation and mechanics of orthogonal/oblique cutting
				2	The student will be able to Analyze the cutting tool geometry of MPCT, mechanism of chip formation, mechanism used and working principle with applications
				3	The student will be able to Identify basic parts and operations of machine tools including lathe, shaper, planer
				4	The student will be able to Categorize basic parts and operations of machine tools including drilling, boring, milling and grinding machine.
4	PC	23ME1402	Lab - Machining Processes	1	The student will be able toCategorize tool materials, draw tool geometry for different machining process like turning, milling, drilling,
				2	The student will be able toAnalyze , calculate cutting forces ,temperature mechanics of material removal for various machining pro
				3	The student will be able to Demonstrate the various machining processes and factors affecting on performance
				4	The students will able to Select and Distinguish various machining processes according to applications and its effect on surround
Sem	Type	Sub. Code	Subject	CO	CO STATEMENTS
4	PC	23ME1403	Lab - Computer Aided Design	1	CO1: Apply Engineering Knowledge in CAD/CAM Software

				2	CO2: Develop Engineering solutions tbrough 3D modelling
				3	CO3:Evaluate Mechanical Engineering designs using engineering tools
				4	CO4: Create technical Documentation effectively
4	VSEC - III	23ME1404	Lab - Machine Drawing	1	Interpret standard drawing conventions, symbols, and notations to create technical drawings that adhere to industrial standards.
				2	Apply appropriate types, sizes, and standard practices for mechanical elements such as threads, fasteners, and couplings, ensuring qualitative understanding without detailed design calculations.
				3	Evaluate geometry and tools suitable for efficient assembly and disassembly of bearings, machine tool parts, and other mechanical components, comprehensive assembly, and subassembly drawings.
				4	Prepare production drawings and associated documents such as nameplates, part lists, revisions, and process sheets essential for manufacturing workflows.
5	PC	22ME501	Heat Transfer	1	Analyse the problems of unidirectional steady state heat conduction systems.
				2	Apply the empirical correlations in convection processes to estimate the heat transfer coefficient.
				3	Design the heat exchangers with LMTD & ϵ-NTU methods.
				4	Evaluate the net thermal radiation exchange between surfaces and estimate radiation view factors using tables, graphs and the view factor relationships.
5	PC	22ME502	Lab:- Heat Transfer	1	Analyze Heat Transfer Mechanisms in Different Modes experimentally
				2	Evaluate Performance of Heat Transfer Systems
				3	Demonstrate Discipline, Safety, and Collaborative Skills
				4	Practice/Develop Documentation, technical Communication, problem-solving and Lifelong Learning capabilities
5	PC	22ME503	Fluid Machines	1	Understand the fundamental fluid mechanics concepts to fluid machines
				2	Analyze the performance parameters of hydraulic machines, including power, efficiency, and dimensional characteristics
				3	Apply compressible flow principles, flow characteristics, and evaluate system parameters
				4	Evaluate the performance of compressors (reciprocating. Centrifugal and axial compressor) through thermodynamic process, work done, efficiency, and conditions for optimal operation.
Sem	Type	Sub. Code	Subject	CO	CO STATEMENTS
5	PC	22ME504	Lab:- Fluid Machines	1	LO1: Analyze Fluid Machinery Principles and Performance Experimentally

				2	LO2: Evaluate the Efficiency and Operational Characteristics of Fluid Machines
				3	LO3: Demonstrate Discipline, Safety, and Collaborative Skills
				4	LO4: Practice/Develop Documentation, Technical Communication, Problem-Solving, and Lifelong Learning Capabilities
5	PC	22ME505	Operations Research Techniques	1	Apply basic operations research techniques to formulate given situation as LPP and Solve by graphical & simplex method.
				2	Solve Transportation and Assignment Models and Analyze the concept of dynamic programming to Solve problems of discreet and continuous variables.
				3	Analyze projects for minimum total cost and smooth level of resources.
				4	Review of different replacement policies and its application in operation research
				5	Appraise the applications of simulation and waiting line models in the field of engineering .
5	PC	22ME506	Machine Drawing	1	Interpret standard drawing conventions, symbols, and notations to create technical drawings that adhere to industrial standards.
				2	Apply appropriate types, sizes, and standard practices for mechanical elements such as threads, fasteners, and couplings, ensuring qualitative understanding without detailed design calculations
				3	Evaluate geometry and tools suitable for efficient assembly and disassembly of bearings, machine tool parts, and other mechanical components, comprehensive assembly and subassembly drawings.
				4	Prepare production drawings and associated documents such as nameplates, part lists, revisions, and process sheets essential for manufacturing workflows.
5	PC	22ME507	Mechanical Measurments & Instrumentation	1	CO-1:- -Describe the basic knowledge of measuring Instruments and illustrate various characteristics.
				2	:Select proper measuring instruments and illustrate it's applications for linear ,angular and speed measurement.
				3	Illustrate Measurement of strain ,force and torque by using a basic strain gauge and it's application in mechanical engineering domain.
				4	:-Apply the principles of Miscellaneous measurements for temperature , level and pressure.
5	PC	22ME508	Mechanical Measurments & Instrumentation lab	1	.Describe the basic knowledge of measuring Instruments and illustrate various characteristics.
				2	Select proper measuring instruments and illustrate it's applications for linear ,angular and speed measurement.
				3	Illustrate Measurement of strain ,force and torque by using a basic strain gauge and it's application in mechanical engineering domain.
				4	Apply the principles of Miscellaneous measurements for temperature , level and pressure.
Sem	**Type**	**Sub. Code**	**Subject**	**CO**	**CO STATEMENTS**
6	PC	22ME601	CAD/CAM	1	Explain and evaluate CAD tools, systems, and their efficient use in modelling and viewing.

				2	Analyze and apply two- and three-dimensional geometric transformations and their concepts.
				3	Discuss wireframe and surface modeling techniques, including parametric representations and curves.
				4	Evaluate solid modeling methods and data exchange formats, with an introduction to CNC and CAM systems.
6	PC	22ME602	CAD/CAM LAB	1	1. CO1: Apply Engineering Knowledge in CAD/CAM Software.
				2	2. CO2: Develop Engineering Solutions through 3D Modeling (Analyze -)
				3	3. CO3: Evaluate Mechanical Designs using Engineering Tools
				4	4) CO4: Practice/Develop Documentation, technical Communication, problem-solving and Lifelong Learning capabilities
6	PC	22ME603	Design of Mechanical Drives	1	Understand current technology and additive manufacturing trends, the working principles, and process parameters of additive manufacturing processes. (L-II)
				2	Explore different additive manufacturing processes and summaries them with materials, suggesting suitable methods for building a particular component. (L-IV)
				3	Design and develop a working model using different techniques. (L-VI)
				4	Discuss the contemporary issues in processing software/algorithms and testing.(L-VI)
6	PE-I	22ME611	PE I : Finite Element Methods	1	Explain the concepts of stress, strain, and deformation in materials, including the governing equations and boundary conditions.
				2	Apply the fundamental principles of Finite Element Method (FEM).
				3	Analyze one-dimensional and two-dimensional engineering problems using FEM,
				4	Evaluate the performance and solutions of machine elements using commercial FEM software.
6	PE-I	22ME612	PE I : Lab:- Finite Element Methods	1	Identify and describe stress and strain in 1-D bar and composite elements using fundamental engineering principles.
				2	Explain the fundamental concepts of Finite Element Methods (FEM) for engineering problem-solving
				3	Analyze and solve problems involving CST elements and 2D truss structures using FEM principles and Mechanical APDL
				4	Evaluate the performance of structural components and interpret results obtained using Mechanical APDL (ANSYS).
Sem	Type	Sub. Code	Subject	CO	CO STATEMENTS
6	PE-I	22ME613	PE I :Industrial Fluid Power	1	Apply fluid power laws and principles to analyze simple fluid power systems, select appropriate fluids, and implement contamination control strategies.

				2	Justify the selection of components for fluid power systems based on their functional characteristics, performance, and application requirements, ensuring safety and efficiency in industrial environments.
				3	Design fluid power systems and circuit diagrams using standard symbols to meet specified requirements, emphasizing efficiency and safety in industrial applications.
				4	Implement safety measures, maintenance practices, and troubleshooting techniques for the efficient operation of fluid power systems, incorporating ethical and professional considerations.
6	PE-I	22ME614	PE I : Lab:- Industrial Fluid Power	1	Apply Knowledge of Fluid Power Principles
				2	Design and Implementation of Fluid Power Circuits
				3	Perform System Maintenance and Troubleshooting
				4	Demonstrate Discipline, Safety, and Collaborative Communication Skills
6	PE-I	22ME615	PE I : I.C. Engines	1	Understand and analyze basic construction and working cycles of I.C. Engines
				2	Analyze fuels, combustion process, pollutionand its control and evaluaterating of I.C. engine fuels
				3	Examine and analyzeC. I. Engines and S. I. Engine.
				4	Analyze Engine performance of I C engine and evaluateby Heat balance sheet calculation
6	PE-I	22ME616	PE I : Lab:- I.C. Engines	1	Apply concepts of thermodynamics to identify and explain the working of IC engine systems and their subcomponents.
				2	Analyze lubrication, cooling, and fuel systems to assess their impact on engine performance and efficiency
				3	Evaluate engine performance parameters and prepare heat balance sheets based on experimental observations
				4	Apply instrumentation and teamwork to conduct experiments and document technical findings of IC engine tests. Develop Skills in Documentation, Technical Communication, Ethics, and Safety Practices
6	PE-I	22ME619	PE I : Computer Integrated Manufacturing	1	To apply the fluid power laws and principals for analysis of simple fluid power systems and fluids.
				2	To identify, analyze, and justify selection of suitable components of fluid power system for specific applications based on its function, performance and working characteristics.
				3	To design and examine the fluid power system and to compose and interpret its circuit diagrams using standard symbols.
				4	To examine the safety measures, maintenance and troubleshooting for fluid power systems.
Sem	Type	Sub. Code	Subject	CO	CO STATEMENTS
6	PE-I	22ME620	Lab:- Computer Integrated Manuf	1	Design and evaluate experimentation on CNC machines.

				2	Designing of GT cell layouts for transforming into flexible manufacturing system.
				3	Compose and transform robot programs various industrial applications.
				4	Justify the role of CAPP and CAQC in computer integrated manufacturing
6	PE-II	22ME634	PE II : Material Handling System	1	Explain the principles and functions of various material handling systems
				2	Apply material handling principles to design basic handling systems for specific applications.
				3	Analyze the efficiency and effectiveness of different material handling methods in various scenarios.
				4	Evaluate the performance of material handling systems considering safety, efficiency, and cost factors.
6	PE-II	22ME632	PE II : Additive Manufacturing	1	Understand current technology and additive manufacturing trends, the working principles, and process parameters of additive manufacturing processes. (L-II)
				2	Explore different additive manufacturing processes and summaries them with materials, suggesting suitable methods for building a particular component. (L-IV)
				3	Design and develop a working model using different techniques. (L-VI)
				4	Discuss the contemporary issues in processing software/algorithms and testing.(L-VI)
6	PE-II	22ME633	PE II : Fuel Cell Technology	1	Apply knowledge of performance, behavior, operational issues and challenges for all major types of fuel cells for its commercialization.
				2	Investigate and Apply know-how of thermodynamics, electrochemistry, heat transfer, and fluid mechanics principles to design and analysis of this emerging technology.
				3	Design & analyze innovative fuel cell systems, fuel cell charge transport and mass transport, the techniques, skills, and modern engineering tools necessary for design and analysis.
				4	Examine and evaluate the methodology to design the components of fuel cells and specific type of fuel cell systems.
6	PE-II	22ME639	PE II : Advanced Manufacturing Techniques	1	Describe principles of mechanical processes
				2	2. Analyze Chemical and Electrochemical Processes
				3	3. Evaluate and Implement Thermo-Electric and High-Energy Processes
				4	4. Explore Additive Manufacturing and Emerging Technologies.
Sem	Type	Sub. Code	Subject	CO	CO STATEMENTS
6	PE-III	22ME651	PE III : Artificial Intelligence	1	Examine the issues involved in knowledge bases, reasoning systems and planning

				2	Design and evaluate intelligent expert models for perception and prediction from intelligent environment.
				3	Apply AI frameworks and platforms to improve business, organizational, and technology outcomes.
				4	Analyze the concept of neural networks for learning linear and non-linear activation functions
6	PE-III	22ME652	PE III : Design for Manufacturing & Assembly	1	CO-1 :-Understanding and Application of Design Principles.
				2	CO-2:- Designing for Metal Casting
				3	CO-3 :- Optimizing for Machining and Metal Joining Processes
				4	CO-4:- Analyse the different requirements of Automated assembly based on Designed parameters
				5	CO-5:- Analyse and apply the various design concept related to manual assembly for designed product..
6	PE-III	22ME653	PE III : Renewable Energy System	1	1. CO1 – Explain the fundamental concepts, working principles, and applications of solar radiation, wind energy, biomass, tidal, geothermal, and other renewable energy sources. (Cognitive Level: Understand, WK1, WK4)
				2	2. CO2 – Apply the principles of Magneto Hydro Dynamic (MHD) power generation and electrochemical processes involved in hydrogen fuel cells to evaluate its feasibility as a sustainable energy conversion method. (Cognitive Level: Apply, WK3, WK6)
				3	3. CO3 – Analyze the performance, design, and efficiency of various solar collectors, wind energy conversion systems, tidal and biomass gasifiers for effective energy utilization. (Cognitive Level: Analyze, WK2, WK3, WK6)
				4	4. CO4 – Evaluate the potential, operational efficiency, and feasibility of geothermal energy systems under varying environmental and site-specific conditions. (Cognitive Level: Evaluate, WK7, WK8)
6	PE-III	22ME654	PE III : Plastics and Composite	1	CO1 Identify polymers based on their chemistry, physical properties, applications, advantages, and limitations.
				2	CO2 Illustrate the processes of extrusion, blow molding, casting, thermoforming, rotational molding, injection molding, compression molding, filament winding, and pultrusion including mold design principles.
				3	CO3 Examine the machining properties and parameters of plastics, their impact on processes, and the methods for joining plastics, including mechanical fasteners, thermal bonding, and press-fitting.
				4	CO4 Distinguish the different compositions of plastics' solid and liquid-state fabrication techniques.
				5	CO5 Assess various polymer processing and composite fabrication techniques, evaluating their advantages, limitations, and suitability for specific engineering applications.
Sem	Type	Sub. Code	Subject	CO	CO STATEMENTS
6	PR	22ME604	PROJECT PHASE-1 MINI PROJECT	1	1) Plan (L5) and accomplish (L6) an innovative engineering mini-project, within given constraints, using knowledge and skills developed during the course.
				2	2) Investigate (L6) a complex problem by formulating (L6) a research question, appraising current literature and developments, and applying (L3) research principles/ methods to produce (L6) scientific content in the form of technical report, thesis, publications, posters and patents.

				3	3) Apply (L3) technological tools/methods/ software effectively to design (L6)/ formulate and conduct(L6) experiments and then Correlate (L4) the theoretical and experimental/simulations results and draw (L3) the proper inferences to come out with concrete solutions.
				4	4) Develop (L6) conceptual and engineering design/ formulation of any process/mechanical components/ system and also to fabricate/ simulate/operate them applying (L3) different technical skills, engineering tools /management principles/ processes/ application software effectively within technical, budgetary, risk, ethical, societal and time constraints.
				5	5) Apply (L3) problem-solving methodologies to generate (L6), evaluate (L5) and justify (L4) innovative solutions
				6	6) Reflect (L5) on professional engineering practice, management principles and its impact on the project, including safety, ethical, legal, social, cultural and sustainability considerations, along with knowledge of contemporary issues
				7	7) Demonstrate (L3) professionalism, integrity, ethical conduct and professional accountability in all aspects of project work, including teamwork and multidisciplinary approach.
				8	8) Demonstrate (L3) effective professional written and oral communication to a variety of audiences through proposals, reports, documentation and presentations.
				9	9) Justify (L5) the need for lifelong learning activities to cope up with technological changes.
7	PC	ME2401	Automation In Production	1	Design and evaluate product layout using line balancing.
				2	Develop and optimize CNC programs for automated machining.
				3	Assess and implement industrial robotics and automation in manufacturing systems
				4	Design GT-based Flexible Manufacturing Systems (FMS) for efficient production.
				5	Apply computer-aided manufacturing (CAM) and automated inspection in modern production systems.
7	PC	ME2402	Lab:- Automation In Production	1	CO1: Develop and execute CNC part programs (manual, APT, and controller-based) for machining operations.
				2	CO2: Analyze and evaluate automated manufacturing systems through industrial case studies.
				3	CO3:Apply robotic programming and kinematics principles using simulation and real systems.
				4	CO4:Demonstrate additive manufacturing techniques using industrial 3D printers.
7	PE-II	ME2412	PE II : Additive Manufacturing	1	Understand current technology and additive manufacturing trends, the working principles and process parameters of additive manufacturing processes
				2	Explore different additive manufacturing processes and summarise them with materials, suggest suitable methods for building a particular component
				3	Design and develop a working model using different techniques
				4	Discuss the contemporary issues in processing software's/algorithms and testing
Sem	**Type**	**Sub. Code**	**Subject**	**CO**	**CO STATEMENTS**
7	PE-II	ME2413	PE II : Fuel Cell Technology	1	Apply knowledge of performance, behavior, operational issues and challenges for all major types of fuel cells for its commercialization.
				2	Investigate and Apply know-how of thermodynamics, electrochemistry, heat transfer, and fluid mechanics principles to design and analysis of this emerging technology.
				3	Design & analyze innovative fuel cell systems, fuel cell charge transport and mass transport, the techniques, skills, and modern engineering tools necessary for design and analysis.

				4	Examine and evaluate the methodology to design the components of fuel cells and specific type of fuel cell systems.
7	PE-II	ME2414	PE II : Refrigeration and Air Conditioning	1	Apply psychrometric principles to analyze air conditioning processes and human comfort parameters.
				2	Apply knowledge of refrigerants and multistage refrigeration systems to select appropriate components and systems.
				3	Analyze heat load components and air distribution systems to design efficient air conditioning systems.
				4	Analyze advanced refrigeration technologies like absorption systems, cryogenics, and thermoelectric refrigeration for various applications.
				5	Evaluate performance of vapour compression refrigeration systems considering sub-cooling, superheating, and pressure losses.
7	PE-II	ME2417	PE II : Advanced Manufacturing Techniques	1	Describe principles of mechanical processes
				2	2. Analyze Chemical and Electrochemical Processes
				3	3. Evaluate and Implement Thermo-Electric and High-Energy Processes
				4	4. Explore Additive Manufacturing and Emerging Technologies.
7	PE-III	ME2421	PE III : Vibration	1	Apply and Acquire the basic fundamentals knowledge of vibrations.
				2	Analyze the fundamentals knowledge of vibrations
				3	Identify and Analyze the vibrations in different machines.
				4	Evaluate and Justify vibrations through Mathematical solutions.
7	PE-III	ME2422	PE III : Lab:- Vibration	1	Integrate and apply foundational principles of vibrations to real-world mechanical systems.
				2	Critically analyze vibration fundamentals to interpret their implications in engineering systems.
				3	Diagnose vibration issues in various machines and synthesize appropriate analytical approaches.
				4	Formulate and validate mathematical models to solve and justify vibration-related engineering problems.
Sem	**Type**	**Sub. Code**	**Subject**	**CO**	**CO STATEMENTS**
7	PE-III	ME2425	PE III : Vehicle Engineering	1	Demonstrate the concepts of stress, strain, and material deformation, covering their equations and boundary conditions
				2	Apply the fundamental principles of Finite Element Method
				3	Analyze one-dimensional and two-dimensional engineering problems using FEM,
				4	Evaluate the performance and solutions of machine elements using commercial FEM software.

7	PE-III	ME2426	PE III : Lab:- Vehicle Engineering	1	Classify & Evaluate various systems of Engine, its function including fuel supply, cooling and lubrication system in vehicle.
				2	Analyze and Discuss various power transmission systems from clutch to wheel in vehicle.
				3	Analyze control systems like steering, suspension and brakes in vehicle
				4	Analyze and recommend the necessary electrical and luxurious systems and safety system in vehicle
7	PE-III	ME2427	PE III : Solar Energy and It'S Utilisation	1	Interpret the Solar geometry and Evaluate the data from measuring instruments.
				2	Classify Analyze and Discuss Solar Collectors.
				3	Evaluate the performance of solar thermal systems
				4	Design and Develop the solar storage system.
7	PE-III	ME2428	PE III : Lab:- Solar Energy and It'S Utilisation	1	CO-1 :- .Interpret the Solar geometry and Evaluate the data from measuring instruments.
				2	CO-2 :-Classify Analyze and Discuss Solar Collectors.
				3	CO-3 :- .Evaluate the performance of solar thermal systems
				4	CO-4 :-Design and Develop the solar storage system.
7	PE-III	ME2435	PE III : Earth Moving Equipments	1	Illustrate the knowledge in Earth Moving Equipment and its Mechanical components
				2	Illustrate the knowledge in basic Hydraulic system components used in Earth Moving Equipment.
				3	Illustrate the knowledge in Electrical and Electronic system used in Earth Moving Equipment.
				4	Analyze and Evaluate the problems in Earth Moving Equipment systems and provide Solution.
Sem	**Type**	**Sub. Code**	**Subject**	**CO**	**CO STATEMENTS**
7	PE-III	ME2436	PE III : Lab:- Earth Moving Equipments	1	Illustrate the knowledge in Earth Moving Equipment and and components of Mechanical , Hydraulic , Electrical and Electronic system
				2	Analyze and Evaluate the problems in Earth Moving Equipment systems and provide Solution.
				3	Demonstrate Discipline, Safety, and Collaborative Skills
				4	Practice/Develop Documentation, technical Communication, problem-solving and Lifelong Learning capabilities

7	PE-IV	ME2443	PE IV : Renewable Energy System	1	CO1 – Explain the fundamental concepts, working principles, and applications of solar radiation, wind energy, biomass, tidal, geothermal, and other renewable energy sources. (Cognitive Level: Understand, WK1, WK4)
				2	CO2 – Apply the principles of Magneto Hydro Dynamic (MHD) power generation and electrochemical processes involved in hydrogen fuel cells to evaluate its feasibility as a sustainable energy conversion method. (Cognitive Level: Apply, WK3, WK6)
				3	CO3 – Analyze the performance, design, and efficiency of various solar collectors, wind energy conversion systems, tidal and biomass gasifiers for effective energy utilization. (Cognitive Level: Analyze, WK2, WK3, WK6)
				4	CO4 – Evaluate the potential, operational efficiency, and feasibility of geothermal energy systems under varying environmental and site-specific conditions. (Cognitive Level: Evaluate, WK7, WK8)
7	PE-IV	ME2444	PE IV : Engineering of Plastics	1	CO1 Identify polymers based on their chemistry, physical properties, applications, advantages, and limitations.
				2	CO2 Illustrate the processes of extrusion, blow molding, casting, thermoforming, rotational molding, injection molding, compression molding, filament winding, and pultrusion including mold design principles.
				3	CO3 Examine the machining properties and parameters of plastics, their impact on processes, and the methods for joining plastics, including mechanical fasteners, thermal bonding, and press-fitting.
				4	CO4 Distinguish the different compositions of plastics' solid and liquid-state fabrication techniques.
				5	CO5 Assess various polymer processing and composite fabrication techniques, evaluating their advantages, limitations, and suitability for specific engineering applications.
7	PE-IV	ME2446	PE IV : Artificial Intelligence	1	Examine the issues involved in knowledge bases, reasoning systems and planning
				2	Design and evaluate intelligent expert models for perception and prediction from intelligent environment.
				3	Apply AI frameworks and platforms to improve business, organizational, and technology outcomes.
				4	Analyze the concept of neural networks for learning linear and non-linear activation functions
7	PE-IV	ME2447	PE IV : Maintenance Management	1	Demonstrate the maintenance function, its importance, types and organize the maintenance department and reliability concepts
				2	Analyze the failure of a machine and plan the condition monitoring program for a machine
				3	Calculate repair and maintenance cost and evaluate maintenance performance
				4	Interpret maintenance needs of basic electrical and mechanical devices
Sem	**Type**	**Sub. Code**	**Subject**	**CO**	**CO STATEMENTS**
7	PE-V	ME2463	PE V : Power Plant Engineering	1	Analyze and compare the various Thermal power plant.
				2	Analyze the hydroelectric and nuclear power plant
				3	Evaluate and compare the economics of various power plant.
				4	Interpret the Non-conventional and combined operations of different power plant.
7	PE-V	ME2465	Design of Experiments and Taguchi	1	Apply basic statistical methods like frequency distribution, histograms, probability, and averages to organize and understand engineering data.

				2	**Analyze confidence intervals, hypothesis testing, and relationships in data. Use software like MINITAB to create and explain regression models.**
				3	**Evaluate different experiment designs, such as factorial experiments and response surface methods, to find the best settings for engineering processes.**
				4	**Review the Taguchi method, including special tools like signal-to-noise ratios and design of experiments, to improve process performance.**
				5	**Create new solutions by using statistical techniques to improve efficiency and quality in engineering and industrial applications.**
7	PE-V	ME2466	PE V : Industrial Safety	1	**CO-1 :- Evaluate the significance and strategic implications of Occupational Safety in industrial environments**
				2	**CO-2:- Analyze risk factors and implement effective risk management strategies in the workplace**
				3	**CO-3 :- Design and implement remedial measures to effectively manage accidental situations in industrial settings**
				4	**CO-4:- Develop comprehensive safety training programs and awareness initiatives for employee engagement**
7	PE-V	ME2469	PE V : Turbines	1	**Understand the working principles of impulse water turbines**
				2	**Apply the momentum principle to velocity triangles of turbines.**
				3	**Analyze the impact of draft tubes on turbine performance**
				4	**Evaluate the efficiency and power output of reaction turbines**
Sem	**Type**	**Sub. Code**	**Subject**	**CO**	**CO STATEMENTS**
7	STR	ME2409	Mini Project	1	**1) Plan (L5) and accomplish (L6) an innovative engineering mini-project, within given constraints, using knowledge and skills developed during the course.**
				2	**2) Investigate (L6) a complex problem by formulating (L6) a research question, appraising current literature and developments, and applying (L3) research principles/ methods to produce (L6) scientific content in the form of technical report, thesis, publications, posters and patents.**
				3	**3) Apply (L3) technological tools/methods/ software effectively to design (L6)/ formulate and conduct(L6) experiments and then Correlate (L4) the theoretical and experimental/simulations results and draw (L3) the proper inferences to come out with concrete solutions.**
				4	**4) Develop (L6) conceptual and engineering design/ formulation of any process/mechanical components/ system and also to fabricate/ simulate/operate them applying (L3) different technical skills, engineering tools /management principles/ processes/ application software effectively within technical, budgetary, risk, ethical, societal and time constraints.**
				5	**5) Apply (L3) problem-solving methodologies to generate (L6), evaluate (L5) and justify (L4) innovative solutions**

				6	6) Reflect (L5) on professional engineering practice, management principles and its impact on the project, including safety, ethical, legal, social, cultural and sustainability considerations, along with knowledge of contemporary issues
				7	7) Demonstrate (L3) professionalism, integrity, ethical conduct and professional accountability in all aspects of project work, including teamwork and multidisciplinary approach.
				8	8) Demonstrate (L3) effective professional written and oral communication to a variety of audiences through proposals, reports, documentation and presentations.
				9	9) Justify (L5) the need for lifelong learning activities to cope up with technological changes.
Sem	**Type**	**Sub. Code**	**Subject**	**CO**	**CO STATEMENTS**
8	**PR**		**PROJECT PHASE-2 MAJOR PROJECT**	1	1) Plan (L5) and accomplish (L6) an innovative engineering mini-project, within given constraints, using knowledge and skills developed during the course.
				2	2) Investigate (L6) a complex problem by formulating (L6) a research question, appraising current literature and developments, and applying (L3) research principles/ methods to produce (L6) scientific content in the form of technical report, thesis, publications, posters and patents.
				3	3) Apply (L3) technological tools/methods/ software effectively to design (L6)/ formulate and conduct(L6) experiments and then Correlate (L4) the theoretical and experimental/simulations results and draw (L3) the proper inferences to come out with concrete solutions.
				4	4) Develop (L6) conceptual and engineering design/ formulation of any process/mechanical components/ system and also to fabricate/ simulate/operate them applying (L3) different technical skills, engineering tools /management principles/ processes/ application software effectively within technical, budgetary, risk, ethical, societal and time constraints.
				5	5) Apply (L3) problem-solving methodologies to generate (L6), evaluate (L5) and justify (L4) innovative solutions
				6	6) Reflect (L5) on professional engineering practice, management principles and its impact on the project, including safety, ethical, legal, social, cultural and sustainability considerations, along with knowledge of contemporary issues

7	**7) Demonstrate (L3) professionalism, integrity, ethical conduct and professional accountability in all aspects of project work, including teamwork and multidisciplinary approach.**
8	**8) Demonstrate (L3) effective professional written and oral communication to a variety of audiences through proposals, reports, documentation and presentations.**
9	**9) Justify (L5) the need for lifelong learning activities to cope up with technological changes.**

Dr. J. P.Giri
HoD, M.E

Dr. U.P. Waghe
Principal, YCCE