

DEPARTMENT OF MECHANICAL ENGINEERING

SEMESTER III

SL NO	COURSE CODE	COURSE NAME	CO No	CO DESCRIPTION
1	MAT201	PARTIAL DIFFERENTIAL EQUATION AND COMPLEX ANALYSIS	1	Understand the concept and the solution of partial differential equation.
			2	Analyse and solve one dimensional wave equation and heat equation.
			3	Understand complex functions, its continuity differentiability with the use of Cauchy Riemann equations.
			4	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function.
			5	Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.
2	MET201	MECHANICS OF SOLIDS	1	Determine the stresses, strains and displacements of structures by tensorial and graphical(Mohr's circle) approaches
			2	Analyse the strength of materials using stress-strain relationships for structural and thermal loading
			3	Perform basic design of shafts subjected to torsional loading and analyse beams subjected to bending moments
			4	Determine the deformation of structures subjected to various loading conditions using strain energy methods
			5	Estimate the strength of thin cylinders, spherical vessels and columns, and appreciate the theories of failures and its relevance in mechanical design
3	MET203	MECHANICS OF FLUIDS	1	Define Properties of Fluids and Solve hydrostatic problems
			2	Explain fluid kinematics and Classify fluid flows
			3	Interpret Euler and Navier-Stokes equations and Solve problems using Bernoulli's equation
			4	Explain the concept of boundary layer and its applications
			5	Use dimensional Analysis for model studies

4	MET 205	METALLURGY & MATERIAL SCIENCE	1	Understand the basic chemical bonds, crystal structures (BCC, FCC, and HCP), and their relationship with the properties.
			2	Analyze the microstructure of metallic materials using phase diagrams and modify the microstructure and properties using different heat treatments.
			3	How to quantify mechanical integrity and failure in materials.
			4	Apply the basic principles of ferrous and non-ferrous metallurgy for selecting materials
			5	Define and differentiate engineering materials on the basis of structure and properties for engineering applications.
5	MCN201	SUSTAINABLE ENGINEERING	1	Understand the relevance and the concept of sustainability and the global initiatives in this direction
			2	Explain the different types of environmental pollution problems and their sustainable solutions
			3	Discuss the environmental regulations and standards
			4	Outline the concepts related to conventional and non-conventional energy
			5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles
6	HUT200	PROFESSIONAL ETHICS	1	Understand the core values that shape the ethical behaviour of a professional.
			2	Adopt a good character and follow an ethical life.
			3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics
			4	Solve moral and ethical problems through exploration and assessment by established experiments
			5	Apply the knowledge of human values and social values to contemporary ethical values and global issues

7	MEL 201	COMPUTER AIDED MACHINE DRAWING	1	Apply the knowledge of engineering drawings and standards to prepare standard dimensioned drawings of machine parts and other engineering components.
			2	Prepare standard assembly drawings of machine components and valves using part drawings and bill of materials.
			3	Apply limits and tolerances to components and choose appropriate fits for given assemblies
			4	Interpret the symbols of welded, machining and surface roughness on the component drawings.
			5	Prepare part and assembly drawings and Bill of Materials of machine components and valves using CAD software.
8	MEL203	MATERIALS TESTING LAB	1	To understand the basic concepts of analysis of circular shafts subjected to torsion.
			2	To understand the behaviour of engineering component subjected to cyclic loading and failure concepts
			3	Evaluate the strength of ductile and brittle materials subjected to compressive, Tensile shear and bending forces
			4	Evaluate the microstructural morphology of ductile or brittle materials and its fracture modes (ductile /brittle fracture) during tension test
			5	To specify suitable material for applications in the field of design and manufacturing.
SEMESTER IV				
1	MAT202	PROBABILITY, STATISTICS AND NUMERICAL METHODS	1	Understand the concept, properties and important models of discrete random variables and,using them, analyse suitable random phenomena.
			2	Understand the concept, properties and important models of continuous random variables and,using them, analyse suitable random phenomena.
			3	Perform statistical inferences concerning characteristics of a population based on attributes of samples drawn from the population
			4	Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques
			5	Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations.

2	MET202	ENGINEERING THERMODYNAMICS	1	Understand basic concepts and laws of thermodynamics
			2	Conduct first law analysis of open and closed systems
			3	Determine entropy and availability changes associated with different processes
			4	Understand the application and limitations of different equations of state
			5	Determine change in properties of pure substances during phase change processes
			6	Evaluate properties of ideal gas mixtures
3	MET204	MANUFACTURING PROCESS	1	Illustrate the basic principles of foundry practices and special casting processes, their advantages, limitations and applications.
			2	Categorize welding processes according to welding principle and material.
			3	Understand requirements to achieve sound welded joint while welding different similar and dissimilar engineering materials.
			4	Student will estimate the working loads for pressing, forging, wire drawing etc.processes
			5	Recommend appropriate part manufacturing processes when provided a set of functional requirements and product development constraints.
4	MET 206	FLUID MACHINERY	1	Explain the characteristics of centrifugal and reciprocating pumps
			2	Calculate forces and work done by a jet on fixed or moving plate and curved plates
			3	Explain the working of turbines and Select a turbine for specific application.
			4	Analyse the working of air compressors and Select the suitable one based on application.
			5	Analyse gas turbines and Identify the improvements in basic gas turbine cycles.
			6	Explain the characteristics of centrifugal and reciprocating pumps

5	EST200	DESIGN AND ENGINEERING	1	Explain the different concepts and principles involved in design engineering.
			2	Apply design thinking while learning and practicing engineering.
			3	Develop innovative, reliable, sustainable, and economically viable designs incorporating knowledge in engineering.
6	MCN202	CONSTITUTION OF INDIA	1	Explain the background of the present constitution of India and features.
			2	Utilize the fundamental rights and duties.
			3	Understand the working of the union executive, parliament and judiciary.
			4	Understand the working of the state executive, legislature and judiciary.
			5	Utilize the special provisions and statutory institutions.
			6	Show national and patriotic spirit as responsible citizens of the country
7	MEL 202	FM & HM LAB	1	Determine the coefficient of discharge of flow measuring devices (notches, orifice meter and Venturi meter)
			2	Calibrate flow measuring devices (notches, orifice meter and Venturi meter)
			3	Evaluate the losses in pipes
			4	Determine the metacentric height and stability of floating bodies Determine the metacentric height and stability of floating bodies
			5	Determine the efficiency and plot the characteristic curves of different types of pumps and turbines.
8	MEL 204	MACHINE TOOLS LAB- I	1	The students can operate different machine tools with understanding of work holders and operating principles to produce different part features to the desired quality.
			2	Apply cutting mechanics to metal machining based on cutting force and power consumption
			3	Select appropriate machining processes and process parameters for different metals.
			4	Fabricate and assemble various metal components by welding and students will be able to visually examine their work and that of others for discontinuities and defects.
			5	Infer the changes in properties of steel on annealing, normalizing, hardening and tempering

SEMESTER V

1	MET301	MECHANICS OF MACHINERY	1	Explain the fundamentals of kinematics, various planar mechanisms and interpret the basic principles of mechanisms and machines
			2	Perform analysis and synthesis of mechanisms.
			3	Solve the problem on cams and gear drives, including selection depending on requirement.
			4	Calculate the gyroscopic effect in various situations.
			5	Analyse rotating and reciprocating masses for its unbalance
2	MET303	THERMAL ENGINEERING	1	Explain the working of steam power cycle and related components.
			2	Discuss the working of steam turbines and methods for evaluating the performance.
			3	Illustrate the performance testing and evaluation of IC engines.
			4	Explain the combustion phenomenon and pollution in IC engines.
			5	Discuss the principles of refrigeration and air-conditioning and basic design considerations.
3	MET305	INDUSTRIAL & SYSTEMS ENGINEERING	1	Implement various tools and techniques in industrial engineering.
			2	Calculate the inventory system for a given requirement.
			3	Explain the importance of industrial relations.
			4	Select the lean manufacturing tools to find and eliminate wastes.
			5	Identify the framework of agile manufacturing.
			6	Identify core and extended modules of enterprise resource planning.

4	MET 307	MACHINE TOOLS AND METROLOGY	1	Analyze various machining process and calculate relevant quantities such us velocities,forces and powers.
			2	Analyze of the tool nomenclature with surface roughness obtainable in each machining processes.
			3	Understand the limitations of various machining process with regard to shape formation and surface texture.
			4	Demonstrate knowledge of the underlying principles of measurement, as they relate to mechanical measurement, electronic instrumentation, and thermal effects.
			5	Get an exposure to advanced measuring devices and machine tool metrology.
5	HUT 310	MANAGEMENT FOR ENGINEERS	1	Explain the characteristics of management in the contemporary context
			2	Describe the functions of management
			3	Demonstrate ability in decision making process and productivity analysis
			4	Illustrate project management technique and develop a project schedule
			5	Summarize the functional areas of management
			6	Comprehend the concept of entrepreneurship and create business plans
6	MCN301	DISASTER MANAGEMENT	1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle
			2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment
			3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk
			4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community
			5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions
			6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level

7	MEL331	MACHINE TOOLS LAB II	1	Apply the procedures to measure length, angles, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness by using different instruments and by different indirect methods.
			2	Determine limits and fits and allocate tolerances for machine components.
			3	CNC programming and to use coordinate measuring machine to record measurements of complex profiles with high sensitivity.
			4	Use effective methods of measuring straightness, Squareness, flatness, roundness, profile, screw threads and gear teeth.
			5	Securing knowledge of manufacturing components within the tolerance limit and surface roughness according to given drawings using various machine tools.
8	MEL333	THERMAL ENGINEERING LAB 1	1	Measure thermo-physical properties of solid, liquid and gaseous fuels.
			2	Identify various systems and subsystems of Diesel and petrol engines.
			3	Analyse the performance characteristics of internal combustion engines
			4	Investigate the emission characteristics of exhaust gases from IC Engines.
			5	Interpret the performance characteristics of air compressors / blowers.
SEMESTER VI				
1	MET302	HEAT & MASS TRANSFER	1	Apply principles of heat and mass transfer to engineering problems.
			2	Analyse and obtain solutions to problems involving various modes of heat transfer.
			3	Design heat transfer systems such as heat exchangers, fins, radiation shields etc.
			4	Define laminar and turbulent boundary layers and ability to formulate energy equation in flow systems.

2	MET304	DYNAMICS AND DESIGN OF MACHINERY	1	Do engine force analysis and to draw turning moment diagrams.
			2	Analyse free and forced vibrations of single degree of freedom systems.
			3	Determine the natural frequencies of a two degree of freedom vibrating system and to calculate the stresses in a structural member due to combined loading.
			4	Design machine elements subjected to fatigue loading and riveted joints.
			5	Design welded joint and close coiled helical compression spring.
3	MET 306	ADVANCED MANUFACTURING ENGINEERING	1	To be conversant with the advanced machining process and to appreciate the effect of process parameters on the surface integrity aspects during the advanced machining process.
			2	CNC programming, select appropriate tooling and fixtures.
			3	To categorize the various nontraditional material removal process based on energy sources and mechanism employed.
			4	Analyze the processes and evaluate the role of each process parameter during micro machining of various advanced material removal processes.
			5	Explain the processes used in additive manufacturing for a range of materials and applications.
4	MET 312	NON DESTRUCTIVE TESTING	1	Have a basic knowledge of surface NDT which enables to carry out various inspections in accordance with the established procedures.
			2	The students will be able to differentiate various defect types and select the appropriate NDT methods for the specimen.
			3	Calibrate the instrument and evaluate the component for imperfections.
			4	Have a basic knowledge of ultrasonic testing which enables them to perform inspection of samples.
			5	Have a complete theoretical and practical understanding of the radiographic testing, interpretation and evaluation.
5	HUT300	INDUSTRIAL ECONOMICS AND FOREIGN TRADE	1	Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare
			2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production
			3	Determine the functional requirement of a firm under various competitive conditions.
			4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society.
			5	Determine the impact of changes in global economic policies on the business opportunities of a firm

6	MET308	COMPREHENSIVE COURSE WORK	1	Learn to prepare for a competitive examination
			2	Comprehend the questions in Civil Engineering field and answer them with confidence
			3	Communicate effectively with faculty in scholarly environments
			4	Analyze the comprehensive knowledge gained in basic courses in the field of Civil Engineering
7	MEL332	COMPUTER AIDED DESIGN & ANALYSIS LAB	1	Gain working knowledge in Computer Aided Design and modelling procedures.
			2	Gain knowledge in creating solid machinery parts.
			3	Gain knowledge in assembling machine elements.
			4	Gain working knowledge in Finite Element Analysis.
			5	Solve simple structural, heat and fluid flow problems using standard software.
8	MEL334	THERMAL ENGINEERING LAB-II	1	Evaluate thermal properties of materials in conduction, convection and radiation.
			2	Analyse the performance of heat exchangers
			3	Illustrate the operational performances of refrigeration and air conditioning systems.
			4	Perform calibration of thermocouples and pressure gauges.

SEMESTER VII

1	MET401	DESIGN OF MACHINE ELEMENTS	1	Design shafts based on strength, rigidity and design for static and fatigue loads, design flat belts and connecting rod of IC engines.
			2	Design clutches and brakes.
			3	Analyse sliding contact bearings and understand design procedure of journal, ball and roller bearings.
			4	Design Spur gear and helical gear.
			5	Design Bevel gears and worm gears.

2	MET473	AIR CONDITIONING AND REFRIGERATION	1	Explain the basics of refrigeration process.
			2	Analyse the vapour compression refrigeration system and to improve the performance.
			3	Describe vapour absorption and steam refrigeration system.
			4	Design refrigeration system by selecting suitable components and environmentally refrigerant.
			5	Evaluate the cooling load and capacity requirement of ac machine.
3	MCN401	INDUSTRIAL SAFETY ENGINEERING	1	Describe the theories of accident causation and preventive measures of industrial accidents
			2	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping
			3	Explain different issues in construction industries
			4	Describe various hazards associated with different machines and mechanical material handling
			5	Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards
4	MEL411	MECHANICAL ENGINEERING LAB	1	Get practical knowledge on design and analysis of mechanisms in the machines.
			2	Measure the cutting forces associated with milling machining operations.
			3	Apply the basic concepts of hydraulic and pneumatic actuators and their applications in product and processes.
			4	Use appropriate systems for data acquisition and control of product and processes
5	MEQ413	SEMINAR	1	Identify academic documents from the literature which are related to her/his areas of interest
			2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest
			3	Prepare a presentation about an academic document
			4	Give a presentation about an academic document
			5	Prepare a technical report

6	MET445	RENEWABLE ENERGY ENGINEERING	1	Explain renewable energy sources and evaluate the implication of renewable energy.To predict solar radiation at a location
			2	Explain solar energy collectors, storages, solar cell characteristics and applications.
			3	Explain the different types of wind power machines and control strategies of wind Turbines.
			4	Explain the ocean energy and conversion devices and different Geothermal sources
			5	Explain biomass energy conversion devices. Calculate the Net Present value and payback period
7	MED415	PROJECT PHASE 1	1	Model and solve real world problems by applying knowledge across domains
			2	Develop products, processes or technologies for sustainable and socially relevant applications
			3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
			4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
			5	Identify technology/research gaps and propose innovative/creative solutions
			6	Organize and communicate technical and scientific findings effectively in writing and oral forms
SEMESTER VIII				
1	MET402	MECHATRONICS	1	Explain the sensors and actuators used in mechatronics.
			2	Design hydraulic and pneumatic circuits for automation.
			3	Explain the manufacturing processes used in MEMS.
			4	Demonstrate the various components of a CNC machine.
			5	Create a PLC program.
			6	Explain the robotic sensors and vision system.

2	MET466	TECHNOLOGY MANAGEMENT	1	Be conversant with important terms for technology management in organisations
			2	Explain the need of technology forecasting
			3	Understand the essence of technology acquisition
			4	Describe the elements of technology strategy
			5	Outline the basics of innovation
			6	Identify human factors in technology management
3	MET414	QUALITY MANAGEMENT	1	To be conversant with important terms for quality management in organisations
			2	Have a complete theoretical and practical understanding of the contributions of Quality Gurus
			3	Demonstrate knowledge of the underlying principles of strategic quality management
			4	Identify various human dimensions of TQM
			5	Implement different tools and techniques in TQM
			6	Identify core and extended modules of ISO 9000 family of standards
4	MET458	ADVANCED ENERGY ENGINEERING	1	Explain the concept of various types of power generation.
			2	Explain solar and wind power generation and its economics.
			3	Explain biomass energy sources and its economics
			4	Explain various renewable energy resources
			5	Explain environmental impacts of various energy generation.

5	MET404	COMPREHENSIVE COURSE VIVA	1	Competent in placement tests and other competitive examinations.
6	MED416	PROJECT PHASE II	1	Model and solve real world problems by applying knowledge across domains
			2	Develop products, processes or technologies for sustainable and socially relevant applications
			3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
			4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
			5	Identify technology/research gaps and propose innovative/creative solutions
			6	Organize and communicate technical and scientific findings effectively in written and oral forms