DEPARTMENT OF MECHANICAL ENGINEERING

Course outcomes

SEMESTER - 1 & 2

Course code	Course Name	Course outcomes		Program Outcomes (POs)											
				1	2	3	4	5	6	7	8	9	10	11	12
MAT 101	LINEAR ALGEBRA AND CALCULUS	CO 1	solve systems of linear equations, diagonalize matrices and characterise quadratic forms	3	3	3	3	2	1			1	2		2
		CO 2	compute the partial and total derivatives and maxima and minima of multivariable functions	3	3	3	3	2	1			1	2		2
		CO 3	compute multiple integrals and apply them to find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminas	3	3	3	3	2	1			1	2		2
		CO 4	perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent	3	2	3	2	1	1			1	2		2
		CO 5	determine the Taylor and Fourier series expansion of functions and learn their applications.	3	3	3	3	2	1			1	2		2
PHT 110	ENGINEERING PHYSICS B (FOR NON-CIRCUIT BRANCHES)	CO 1	Compute the quantitative aspects of waves and oscillations in engineering systems.	3	2						1	2			1
		CO 2	Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments	3	2						1	2			1
		CO 3	Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.	3	2						1	2			1
		CO 4	Apply the knowledge of ultrasonics in non-destructive testing and use the principles of acoustics to explain the nature and characterization of acoustic design and to provide a safe and healthy environment	3							1	2			1

		CO 5	Apply the comprehended knowledge about laser and fibre optic communication systems in various engineering applications	3	2						1	2			1
CYT 100	ENGINEERING CHEMISTRY	CO 1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.	1	2	1									
		CO 2	Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications.	1	1		1	2							
		CO 3	Apply the knowledge of analytical method for characterizing a chemical mixture or a compound. Understand the basic concept of SEM for surface characterisation of nanomaterials.	1	1		1	2							
		CO 4	Learn about the basics of stereochemistry and its application. Apply the knowledge of conducting polymers and advanced polymers in engineering.	2	1										
		CO 5	Study various types of water treatment methods to develop skills for treating wastewater.	1			1			3					
EST 100	ENGINEERING MECHANICS	CO 1	Recall principles and theorems related to rigid body mechanics	2	2										
		CO 2	Identify and describe the components of system of forces acting on the rigid body	3	3										
		CO 3	Apply the conditions of equilibrium to various practical problems involving different force system	3	3										
		CO 4	Choose appropriate theorems, principles or formulae to solve problems of mechanics	3	3										
		CO 5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses	3	3										

EST 110	ENGINEERING GRAPHICS	CO 1	Draw the projection of points and lines located in different quadrants	3												
		CO 2	Prepare multiview orthographic projections of objects by visualizing them in different positions	3												
		CO 3	Draw sectional views and develop surfaces of a given object	3	1											
		CO 4	Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.	3									1			
		CO 5	Convert 3D views to orthographic views	3									2			
		CO 6	Obtain multiview projections and solid models of objects using CAD tools	3				3					3			
		CO 1	Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.	3					3	2	2					
		CO 2	Explain different types of buildings, building components, building materials and building construction	3	2						3					
		CO 3	Describe the importance, objectives and principles of surveying.	3	2				2	3		2				
		CO 4	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps	3	2		1	3				2				
		CO 5	Discuss the Materials, energy systems, water management and environment for green buildings.	3	2			3				2				

EST 120	BASICS OF CIVIL & MECHANICAL ENGINEERING	CO 6	Analyse thermodynamic cycles and calculate its efficiency	3	2			3							
		CO 7	Illustrate the working and features of IC Engines	3	1			3							
		CO 8	Explain the basic principles of Refrigeration and Air Conditioning	3	1										
		CO 9	Describe the working of hydraulic machines	3	2										
		CO 10	Explain the working of power transmission elements	3	1										
		CO 11	Describe the basic manufacturing, metal joining and machining processes	3											
EST 130	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	CO 1	Apply fundamental concepts and circuit laws to solve simple DC electric circuits	3	1										2
		CO 2	Develop and solve models of magnetic circuits	3	1										2
		CO 3	Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state	3	1										2
		CO 4	Describe working of a voltage amplifier	2											
		CO 5	Outline the principle of an electronic instrumentation system	2											2

		CO 6	Explain the principle of radio and cellular communication	2												2
HUN 101	LIFE SKILLS	CO 1	Define and Identify different life skills required in personal and professional life						2		1	2	2	1	3
		CO 2	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.									3			2
		CO 3	Explain the basic mechanics of effective communication and demonstrate these through presentations.						1			1	3		
		CO 4	Take part in group discussions										3		1
		CO 5	Use appropriate thinking and problem solving techniques to solve new problems		3		2	1							
		CO 6	Understand the basics of teamwork and leadership						1			3			
MAT 102	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	CO 1	Compute the derivatives and line integrals of vector functions and learn their applications	3	3	3	3	2	1			1	2		2
		CO 2	Evaluate surface and volume integrals and learn their inter-relations and applications	3	3	3	3	2	1			1	2		2
		CO 3	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients	3	3	3	3	2	1			1	2		2
		CO 4	Compute Laplace transform and apply them to solve ODEs arising in engineering	3	3	3	3	2	1			1	2		2

		CO 5	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering	3	3	3	3	2	1			1	2		2
HUN 102	PROFESSIONAL COMMUNICATION	CO 1	Develop vocabulary and language skills relevant to engineering as a profession										3		2
		CO 2	Analyze, interpret and effectively summarize a variety of textual content										1		3
		CO 3	Create effective technical presentations						1			1	3		
		CO 4	Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus										3		1
		CO 5	Identify drawbacks in listening patterns and apply listening techniques for specific needs		1							2	3		
		CO 6	Create professional and technical documents that are clear and adhering to all the necessary conventions	1					1			1	3		
EST 102	PROGRAMING IN C	CO 1	Analyze a computational problem and develop an algorithm/flowchart to find its solution	*	*	*		*					*	*	*
		CO 2	Develop readable* C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators.	*	*	*	*						*		*
		CO 3	Write readable C programs with arrays, structure or union for storing the data to be processed	*	*	*	*						*		*
		CO 4	Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem	*	*	*	*						*	*	*

		CO 5	Write readable C programs which use pointers for array processing and parameter passing	*	*		*						*		*
		CO 6	Develop readable C programs with files for reading input and storing output	*	*		*						*		*
PHL 120	ENGINEERING PHYSICS LAB	CO 1	Develop analytical/experimental skills and impart prerequisite hands on experience for engineering laboratories	3				3			1	2			1
		CO 2	Understand the need for precise measurement practices for data recording	3				3			1	2			1
		CO 3	Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations	3				3			1	2			1
		CO 4	Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics	3				3			1	2			1
		CO 5	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results	3				3			1	2			1
CYL 120	ENGINEERING CHEMISTRY LAB	CO 1	Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses	3				2							3
		CO 2	Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs	3				3							3
		CO 3	Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds	3				3							3
		CO 4	Acquire the ability to understand, explain and use instrumental techniques for chemical analysis	3				3							3

		CO 5	Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments	3				1								3
		CO 6	Function as a member of a team, communicate effectively and engage in further learning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum	3				1								3
ESL 120	CIVIL & MECHANICAL WORKSHOP	CO 1	Name different devices and tools used for civil engineering measurements	1				1	1			2	2			
		CO 2	Explain the use of various tools and devices for various field measurements	1				1	1			2	2			
		CO 3	Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work	1				1	1		2	2	2	1		
		CO 4	Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.	1				1	1		2	2	2	1	1	
		CO 5	Compare different techniques and devices used in civil engineering measurements	1				1	1			2	2		1	
		CO 6	Identify Basic Mechanical workshop operations in accordance with the material and objects	1												
		CO 7	Apply appropriate Tools and Instruments with respect to the mechanical workshop trades	2												
		CO 8	Apply appropriate safety measures with respect to the mechanical workshop trades	2												
		CO 1	Demonstrate safety measures against electric shocks						3							1

ESL 130	ELECTRICAL & ELECTRONICS WORKSHOP	CO 2	Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols										2								1		
		CO 3	Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings										2			1		1		1	2	2		2
		CO 4	Identify and test various electronic components										3											2
		CO 5	Draw circuit schematics with EDA tools										3				2							2
		CO 6	Assemble and test electronic circuits on boards										3				2							1
		CO 7	Work in a team with good interpersonal skills																		3	2		2
SEMESTER - 3																								
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													1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
MAT201	PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS	CO 1	Understand the concept and the solution of partial differential equation.										3	3	3	3	2	1				2		2
		CO 2	Analyse and solve one dimensional wave equation and heat equation.										3	3	3	3	2	1				2		2
		CO 3	Understand complex functions, its continuity differentiability with the use of CauchyRiemann equations.										3	3	3	3	2	1				2		2

	ANALYSIS	CO 4	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function	3	3	3	3	2	1				2		2
		CO 5	Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.	3	3	3	3	2	1				2		2
MET201	MECHANICS OF SOLIDS	CO 1	Determine the stresses, strains and displacements of structures by tensorial and graphical (Mohr's circle) approaches	3	3	2									1
		CO 2	Analyse the strength of materials using stress-strain relationships for structural and thermal loading	3	3	2									1
		CO 3	Perform basic design of shafts subjected to torsional loading and analyse beams subjected to bending moments	3	3	1									2
		CO 4	Determine the deformation of structures subjected to various loading conditions using strain energy methods	3	3	1									1
		CO 5	Analyse column buckling and appreciate the theories of failures and its relevance in engineering design	3	3	1									1
MET203	MECHANICS OF FLUIDS	CO 1	Define Properties of Fluids and Solve hydrostatic problems	3	2										
		CO 2	Explain fluid kinematics and Classify fluid flows	3	2	1									
		CO 3	Interpret Euler and Navier-Stokes equations and Solve problems using Bernoulli's equation	3	2	1									

		CO 4	Evaluate energy loses in pipes and sketch energy gradient lines	3	3	2										
		CO 5	Explain the concept of boundary layer and its applications	3	2	1										
		CO 6	Use dimensional Analysis for model studies	3	2	1										
MET 205	METALLURGY & MATERIAL SCIENCE	CO 1	Understand the basic chemical bonds, crystal structures (BCC, FCC, and HCP), and their relationship with the properties.	3												
		CO 2	Analyze the microstructure of metallic materials using phase diagrams and modify the microstructure and properties using different heat treatments.		3											
		CO 3	How to quantify mechanical integrity and failure in materials				2									
		CO 4	Apply the basic principles of ferrous and non-ferrous metallurgy for selecting materials for specific applications.					3								
		CO 5	Define and differentiate engineering materials on the basis of structure and properties for engineering applications.													2
EST 200	DESIGN AND ENGINEERING	CO 1	Explain the different concepts and principles involved in design engineering.	2	1					1			1			
		CO 2	Apply design thinking while learning and practicing engineering.		2				1		1					2

		CO 3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.			2			1	1		2	2		1
HUT 200	Professional Ethics	CO 1	Understand the core values that shape the ethical behaviour of a professional.								2			2	
		CO 2	Adopt a good character and follow an ethical life.								2			2	
		CO 3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.								3			2	
		CO 4	Solve moral and ethical problems through exploration and assessment by established experiments.								3			2	
		CO 5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.								3			2	
MCN201	SUSTAINABLE ENGINEERING	CO 1	Understand the relevance and the concept of sustainability and the global initiatives in this direction						2	3					2
		CO 2	Explain the different types of environmental pollution problems and their sustainable solutions						2	3					2
		CO 3	Discuss the environmental regulations and standards						2	3					2
		CO 4	Outline the concepts related to conventional and non-conventional energy						2	3					2

		CO 5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles						2	3					2
MEL201	COMPUTER AIDED MACHINE DRAWING	CO 1	Apply the knowledge of engineering drawings and standards to prepare standard dimensioned drawings of machine parts and other engineering components.	3									3		
		CO 2	Preparestandard assembly drawings of machine components and valvesusing part drawings and bill of materials	3		2							3		
		CO 3	Apply limits and tolerances to components and choose appropriate fits for given assemblies	3	2										
		CO 4	Interpret the symbols of welded, machining and surface roughness on the component drawings.	3											
		CO 5	Prepare part and assembly drawings and Bill of Materials of machine components and valves using CAD software.	3				3					3		1
MEL203	MATERIALS TESTING LAB	CO 1	To understand the basic concepts of analysis of circular shafts subjected to torsion.	3				3							
		CO 2	To understand the behaviour of engineering component subjected to cyclic loading and failure concepts	3	3	1		3				3	2	2	1
		CO 3	Evaluate the strength of ductile and brittle materials subjected to compressive, Tensile shear and bending forces	3	3	3	1	3				3	2	3	2
		CO 4	Evaluate the microstructural morphology of ductile or brittle materials and its fracture modes (ductile /brittle fracture) during tension test	3	3	3	3	3	2	2	1	3	2	3	2

		CO 5	To specify suitable material for applications in the field of design and manufacturing.									3	3	3	1	3	2	2	1	3	2	3	2
SEMESTER - 4																							
ourse cod	**Course Name**	**Course outcomes**										**Program Outcomes (POs)**											
												1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
MAT 202	PROBABILITY,STATISTICS AND NUMERICAL METHODS	CO 1	Understand the concept, properties and important models of discrete random variables and,using them, analyse suitable random phenomena.									3	2	2	2	2					2		1
		CO 2	Understand the concept, properties and important models of continuous random variables and,using them, analyse suitable random phenomena									3	2	2	2	2					2		1
		CO 3	Perform statistical inferences concerning characteristics of a population based on attributes of samples drawn from the population									3	2	2	2	2					2		1
		CO 4	Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques									3	2	2	2	2					2		1
		CO 5	Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations.									3	2	2	2	2					2		1
MET202	ENGINEERING THERMODYNAMICS	CO 1	Understand basic concepts and laws of thermodynamics																				
		CO 2	Conduct first law analysis of open and closed systems																				
		CO 3	Determine entropy and availability changes associated with different processes																				

		CO 4	Understand the application and limitations of different equations of state														
		CO 5	Determine change in properties of pure substances during phase change processes														
		CO 6	Evaluate properties of ideal gas mixtures														
MET 204	MANUFACTURING PROCESS	CO 1	Illustrate the basic principles of foundry practices and special casting processes, their advantages, limitations and applications.	3													
		CO 2	Categorize welding processes according to welding principle and material.														2
		CO 3	Understand requirements to achieve sound welded joint while welding different similar and dissimilar engineering materials. .			3											
		CO 4	Student will estimate the working loads for pressing, forging, wire drawing etc. processes				3										
		CO 5	Recommend appropriate part manufacturing processes when provided a set of functional requirements and product development constraints.		3												
		CO 1	Explain the characteristics of centrifugal and reciprocating pumps	3	3	2											
		CO 2	Calculate forces and work done by a jet on fixed or moving plate and curved plates	3	3	2											

MET206	FLUID MACHINERY	CO 3	Explain the working of turbines and Select a turbine for specific application.	3	3	2										
		CO 4	Analyse the working of air compressors and Select the suitable one based on application	3	3	2										
		CO 5	Analyse gas turbines and Identify the improvements in basic gas turbine cycles	3	3	2										
		CO 6	Explain the characteristics of centrifugal and reciprocating pumps	3	3	2										
EST 200	DESIGN AND ENGINEERING	CO 1	Explain the different concepts and principles involved in design engineering.	2	1					1			1			
		CO 2	Apply design thinking while learning and practicing engineering		2				1		1					2
		CO 3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.			2			1	1		2	2			1
HUT 200	PROFESSIONAL ETHICS	CO 1	Understand the core values that shape the ethical behaviour of a professional.													
		CO 2	Adopt a good character and follow an ethical life.													
		CO 3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.													

		CO 4	Solve moral and ethical problems through exploration and assessment by established experiments.														
		CO 5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.														
MCN202	CONSTITUTION OF INDIA	CO 1	Explain the background of the present constitution of India and features						2	2	2		2				
		CO 2	Utilize the fundamental rights and duties.						3	3	3		3				
		CO 3	Understand the working of the union executive, parliament and judiciary.						3	2	3		3				
		CO 4	Understand the working of the state executive, legislature and judiciary.						3	2	3		3				
		CO 5	Utilize the special provisions and statutory institutions.						3	2	3		3				
		CO 6	Show national and patriotic spirit as responsible citizens of the country						3	3	3		2				
		CO 1	Determine the coefficient of discharge of flow measuring devices (notches, orifice meter and Venturi meter)	2	1						2	3	2		2		
		CO 2	Calibrate flow measuring devices (notches, orifice meter and Venturi meter)	2	1						2	3	2		2		

MEL202	FM & HM LAB	CO 3	Evaluate the losses in pipes										2	1						2	3	2		2
		CO 4	Determine the metacentric height and stability of floating bodies										2	1						2	3	2		2
		CO 5	Determine the efficiency and plot the characteristic curves of different types of pumps and turbines										2	1						2	3	2		2
MEL 204	MACHINE TOOLS LAB- I	CO 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.												3									
		CO 2	Apply cutting mechanics to metal machining based on cutting force and power consumption.											3										
		CO 3	Select appropriate machining processes and process parameters for different metals.													2								
		CO 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.										2											
		CO 5	Infer the changes in properties of steel on annealing, normalizing, hardening and tempering														2							
SEMESTER - 5																								
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		CO 1	Explain the fundamentals of kinematics, various planar mechanisms and interpret the basic principles of mechanisms and machines										2											

MET301	MECHANICS OF MACHINERY	CO 2	Perform analysis and synthesis of mechanisms	3	3	3	2	2								
		CO 3	Solve the problem on cams and gear drives, including selection depending on requirement.	3	3	2	2	2								
		CO 4	Calculate the gyroscopic effect in various situations	3	2	1	1	1								
		CO 5	Analyse rotating and reciprocating masses for its unbalance	3	2	2	1	2								
MET303	THERMAL ENGINEERING	CO 1	Explain the working of steam power cycle and related components													
		CO 2	Discuss the working of steam turbines and methods for evaluating the performance													
		CO 3	Illustrate the performance testing and evaluation of IC engines													
		CO 4	Explain the combustion phenomenon and pollution in IC engines													
		CO 5	Discuss the principles of refrigeration and air-conditioning and basic design considerations													
		CO 1	Implement various tools and techniques in industrial engineering	2				2				2		2	2	

MET305	INDUSTRIAL & SYSTEMS ENGINEERING	CO 2	Calculate the inventory system for a given requirement	3			2						2	2	2
		CO 3	Explain the importance of industrial relations						1			2	2	1	2
		CO 4	Select the lean manufacturing tools to find and eliminate wastes	2	1		2	1						2	2
		CO 5	Identify the framework of agile manufacturing				2	1				2		2	2
		CO 6	Identify core and extended modules of enterprise resource planning	2				3						2	2
MET 307	MACHINE TOOLS AND METROLOGY	CO 1	Analyze various machining process and calculate relevant quantities such us velocities, forces and powers.	2	3									2	1
		CO 2	Analyze of the tool nomenclature with surface roughness obtainable in each machining processes	2	3									2	1
		CO 3	Understand the limitations of various machining process with regard to shape formation and surface texture.	2	1		2	2							2
		CO 4	Demonstrate knowledge of the underlying principles of measurement, as they relate to mechanical measurement, electronic instrumentation, and thermal effects.	3		2								2	2
		CO 5	Get an exposure to advanced measuring devices and machine tool metrology.	2			2	3							3

MCN 301	DISASTER MANAGEMENT	CO 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				2				2		2
		CO 2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment	2	3	2		2	2	3			3		2
		CO 3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk	2	3	2	2	2	2	3			3		2
		CO 4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community	3	3	3		2	2	3					2
		CO 5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions	3	3			2	2	3					2
		CO 6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level	3					2	3	3				2
HUT 310	MANAGEMENT FOR ENGINEERS	CO 1	Explain the characteristics of management in the contemporary context	2				1	2	2	2		2	1	1
		CO 2	Describe the functions of management	2				1	1		2	1	2	1	1
		CO 3	Demonstrate ability in decision making process and productivity analysis	2	2	2	2	1							
		CO 4	Illustrate project management technique and develop a project schedule	2	2	2	2	1						2	1

		CO 5	Summarize the functional areas of management	2					1	1		1	2	1	
		CO 6	Comprehend the concept of entrepreneurship and create business plans		2	2	2	1	1	1	1	1	1	1	1
MEL331	MACHINE TOOLS LAB II	CO 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.	3											
		CO 2	Determine limits and fits and allocate tolerances for machine components			3									
		CO 3	CNC programming and to use coordinate measuring machine to record measurements of complex profiles with high sensitivity.				3								
		CO 4	Use effective methods of measuring straightness, Squareness, flatness, roundness, profile, screw threads and gear teeth.		3										
		CO 5	Securing knowledge of manufacturing components within the tolerance limit and surface roughness according to given drawings using various machine tools					3							
MEL333	THERMAL ENGINEERING LAB 1	CO 1	Measure thermo-physical properties of solid, liquid and gaseous fuels	3		2	3			2		3	2		2
		CO 2	Identify various systems and subsystems of Diesel and petrol engines	3		2	3			2		3	2		2
		CO 3	Analyse the performance characteristics of internal combustion engines	3		2	3			2		3	2		2

		CO 4	Investigate the emission characteristics of exhaust gases from IC Engines										3		2	3			2		3	2		2
		CO 5	Interpret the performance characteristics of air compressors / blowers										3		2	3			2		3	2		2
SEMESTER - 6																								
ourse cod	**Course Name**	**Course outcomes**											**Program Outcomes (POs)**											
													1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
MET302	HEAT &MASS TRANSFER	CO 1	Apply principles of heat and mass transfer to engineering problems										3	3	2									1
		CO 2	Analyse and obtain solutions to problems involving various modes of heat transfer										3	3	3									2
		CO 3	Design heat transfer systems such as heat exchangers, fins, radiation shields etc.										3	3	3									2
		CO 4	Define laminar and turbulent boundary layers and ability to formulate energy equation in flow systems.										3	3	3									2
MET304	DYNAMICS AND DESIGN OF MACHINERY	CO 1	Do engine force analysis and to draw turning moment diagram										3	3	2									
		CO 2	Analyse free and forced vibrations of single degree of freedom systems										3	3	2									
		CO 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										3	3	2									

		CO 4	Design machine elements subjected to fatigue loading and riveted joints	3	3	2										
		CO 5	Design welded joint and close coiled helical compression spring	3	3	2										
MET 306	ADVANCED MANUFACTURING ENGINEERING	CO 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.	3				2								2
		CO 2	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		2		3								
		CO 3	To categorize the various nontraditional material removal process based on energy sources and mechanism employed	2				2								2
		CO 4	Analyze the processes and evaluate the role of each process parameter during micro machining of various advanced material removal processes.	2	3			2								
		CO 5	Explain the processes used in additive manufacturing for a range of materials and applications.	2			3	2							2	
MET308	COMPREHENSIVE COURSE WORK	CO 1	Learn to prepare for a competitive examination	3	2											2
		CO 2	Comprehend the questions in Mechanical Engineering field and answer them with confidence	3	2											2
		CO 3	Communicate effectively with faculty in scholarly environments	3	2											2

		CO 4	Analyze the comprehensive knowledge gained in basic courses in the field of Mechanical Engineering	2	3										2
HUT 300	INDUSTRIAL ECONOMICS & FOREGIN TRADE	CO 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										3	
		CO 2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production.	2	2			2	2	3				3	
		CO 3	Determine the functional requirement of a firm under various competitive conditions.	2	2	1								3	
		CO 4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society.	2	2	1			1					3	
		CO 5	Determine the impact of changes in global economic policies on the business opportunities of a firm	2	2	1								3	
MET 312	NON DESTRUCTIVE TESTING	CO 1	Have a basic knowledge of surface NDT which enables to carry out various inspections in accordance with the established procedures	3	3	2									1
		CO 2	The students will be able to differentiate various defect types and select the appropriate NDT methods for the specimen.	3	3	2									1
		CO 3	Calibrate the instrument and evaluate the component for imperfections	3	3	1									2
		CO 4	Have a basic knowledge of ultrasonic testing which enables them to perform inspection of samples.	3	3	2									2

		CO 5	Have a complete theoretical and practical understanding of the radiographic testing, interpretation and evaluation.	3	3	1										1
MET 352	AUTOMOBILE ENGINEERING	CO 1	Explain different automotive systems and subsystems .	3												3
		CO 2	Illustrate the principles of transmission, suspension, steering and braking systems of an automobile.	3												3
		CO 3	Build a basic knowledge about the technology in electric vehicles	3												3
		CO 4	Summarize the concept of aerodynamics in automobiles.	3												3
MEL332	COMPUTER AIDED DESIGN & ANALYSIS LAB	CO 1	Gain working knowledge in Computer Aided Design and modelling procedures.	3										2		
		CO 2	Gain knowledge in creating solid machinery parts.	3										3		
		CO 3	Gain knowledge in assembling machine elements.	3	3								2	2		
		CO 4	Gain working knowledge in Finite Element Analysis	3	1	3					1	2	3			
		CO 5	Solve simple structural, heat and fluid flow problems using standard software	3	3	2					2	3	3			

MEL334	THERMAL ENGINEERING LAB-II	CO 1	Evaluate thermal properties of materials in conduction, convection and radiation									3		2	3			2		3	2		2
		CO 2	Analyse the performance of heat exchangers									3		2	3			2		3	2		2
		CO 3	Illustrate the operational performances of refrigeration and air conditioning systems									3		2	3			2		3	2		2
		CO 4	Perform calibration of thermocouples and pressure gauges									3		2	3			2		3	2		2
SEMESTER - 7																							
ourse cod	**Course Name**	**Course outcomes**										**Program Outcomes (POs)**											
												1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
MET401	DESIGN OF MACHINE ELEMENTS	CO 1	Design shafts based on strength, rigidity and design for static and fatigue loads, design flat belts and connecting rod of IC engines									3	3	3									
		CO 2	Design clutches and brakes									3	3	3									
		CO 3	Analyse sliding contact bearings and understand design procedure of journal, ball and roller bearings.									3	3	3									
		CO 4	Design Spur gear and helical gear									3	3	3									
		CO 5	Design Bevel gears and worm gears									3	3	3									

MET413	ADVANCED METHODS IN NON DESTRUCTIVE TESTING	CO 1	Understand the theoretical and practical knowledge in methods of non-destructive testing processes	3		3			2	2	1	2			1
		CO 2	Understand the knowledge of advanced methods in ultrasonic testing which enables them to perform inspection of samples	3		3			2	2	1	2			1
		CO 3	Illustrate complete theoretical and practical understanding of the radiographic testing, interpretation and evaluation	3		3			2	2	1	2			1
		CO 4	Understand the recent advances in the field of non-destructive testing	3		3			2	2	1	2			1
		CO 5	Outline the recent and advanced developments in radiography testing	3		3			2	2	1	2			1
MET473	AIR CONDITIONING AND REFRIGERATION	CO 1	Explain the basics of refrigeration process.	3			1								1
		CO 2	Analyse the vapour compression refrigeration system and to improve the performance	3	2		2								1
		CO 3	Describe vapour absorption and steam refrigeration system.	3	2		2								1
		CO 4	Design refrigeration system by selecting suitable components and environmentally refrigerant.	3	1				2	3					1
		CO 5	Evaluate the cooling load and capacity requirement of ac machine	3	2	2				1					2

MET445	RENEWABLE ENERGY ENGINEERING	CO 1	Explain renewable energy sources and evaluate the implication of renewable energy. To predict solar radiation at a location	3											3
		CO 2	Explain solar energy collectors, storages, solar cell characteristics and applications	3	3			1	1	1				1	3
		CO 3	Explain the different types of wind power machines and control strategies of wind turbines	3	3			1	1	1				1	3
		CO 4	Explain the ocean energy and conversion devices and different Geothermal sources	3	3			1	1	1				1	3
		CO 5	Explain biomass energy conversion devices. Calculate the Net Present value and payback period	3	3			1	1	1				1	3
MEQ413	SEMINAR	CO 1	Identify academic documents from the literature which are related to her/his areas of interest	2	2	1	1	1		2					3
		CO 2	Read and apprehend an academic document from the literature which is related to her/ his areas of interest	3	3	2	3	3		2					3
		CO 3	Prepare a presentation about an academic document	3	2				3		1		2		3
		CO 4	Give a presentation about an academic document	3					2		1		3		3
		CO 5	Prepare a technical report	3	3	3	3	3	2	2	2		3		3

MED415	PROJECT PHASE I	CO 1	Model and solve real world problems by applying knowledge across domains	2	2	2	1	2	2	2	1	1	1	1	2
		CO 2	Develop products, processes or technologies for sustainable and socially relevant applications	2	2	2		1	3	3	1	1		1	1
		CO 3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks									3	2	2	1
		CO 4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms					2			3	2	2	3	2
		CO 5	Identify technology/research gaps and propose innovative/creative solutions	2	3	3	1	2							1
		CO 6	Organize and communicate technical and scientific findings effectively in written and oral forms					2			2	2	3	1	1
MEL411	MECHANICAL ENGINEERING LAB	CO 1	Get practical knowledge on design and analysis of mechanisms in the machines	3	2	2	3	3		2		3	2		2
		CO 2	Measure the cutting forces associated with milling machining operations.	3	2	2	3	3		2		3	2		2
		CO 3	Apply the basic concepts of hydraulic and pneumatic actuators and their applications in product and processes	3	2	2	3	3		2		3	2		2
		CO 4	Use appropriate systems for data acquisition and control of product and processes	3	2	2	3	3		2		3	2		2

MCN401	INDUSTRIAL SAFETY ENGINEERING	CO 1	Describe the theories of accident causation and preventive measures of industrial accidents.										2	2				2	2	2				1
		CO 2	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping.										2	1	2		1	1	1	1				1
		CO 3	Explain different issues in construction industries.										2	2	2		1	1	1	1	1	1		1
		CO 4	Describe various hazards associated with different machines and mechanical material handling.										2	2	2		1	1	1	1	1	1		1
		CO 5	Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards.										2	2	2	1	1	1	1	1	1	1		1
SEMESTER - 8																								
ourse cod	**Course Name**	**Course outcomes**											**Program Outcomes (POs)**											
													1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
		CO 1	Explain the sensors and actuators used in mechatronics										3	2	2									
		CO 2	Design hydraulic and pneumatic circuits for automation.										3	3	3		3							
		CO 3	Explain the manufacturing processes used in MEMS										3	1	1									

MET402	MECHATRONICS	CO 4	Demonstrate the various components of a CNC machine	3	1	1										
		CO 5	Create a PLC program	3	3	3		3								
		CO 6	Explain the robotic sensors and vision system	3	1	1										
MET464	MICRO AND NANO MANUFACTURING	CO 1	Explain different techniques used in micro and nano manufacturing	3						1		2	1	1		
		CO 2	Describe conventional techniques used in micro manufacturing.	2						1		2	1	1		
		CO 3	Describe non-conventional micro-nano manufacturing approaches.	2			2			1		2	1	1		
		CO 4	Outline the working principle and applications of micro and nano finishing processes	3						1		2	1	1		
		CO 5	Explain the basics of micro and nano fabrication techniques.	2						1		2	1	1		
		CO 6	Apply and select metrology systems in micro and nano manufacturing.	3				1				2	1	2	1	
		CO 1	Explain the properties of cryogenic liquids and properties of material at cryogenic temperatures	3	2	1										

MET476	CRYOGENIC ENGINEERING	CO 2	Describe and analyze cryogenic liquefaction systems using first principles of thermodynamics	3	2											
		CO 3	Describe and analyze cryogenics refrigeration using first principles of thermodynamics	3	2	1										
		CO 4	Identify insulation system for cryogenic application and explain cryogenic storage vessels.	3	1											
		CO 5	Understand gas separation and purification methods	3	1											
		CO 6	Understand instrumentation for various measurements in cryogenic engineering.	3	1											
MET458	ADVANCED ENERGY ENGINEERING	CO 1	Explain the concept of various types of power generation	3	1											
		CO 2	Explain solar and wind power generation and its economics	3	1											
		CO 3	Explain biomass energy sources and its economics	3	1											
		CO 4	Explain various renewable energy sources	3	1											
		CO5	Explain environmental impacts of various energy generation	3	1				1	1						

MET404	COMPREHENSIVE COURSE VIVA	CO 1	The objective of this Course viva is to ensure the basic knowledge of each student in the most fundamental core courses in the curriculum.														
		CO 2	The viva voce shall be conducted based on the core subjects studied from third to eighth semester														
		CO 3	helps the learner to become competent in placement tests and other competitive examinations.														
MED416	PROJECT PHASE II	CO 1	Model and solve real world problems by applying knowledge across domains	2	2	2	1	2	2	2	1	1	1	1	2
		CO 2	Develop products, processes or technologies for sustainable and socially relevant applications	2	2	2		1	3	3	1	1		1	1
		CO 3	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks								3	2	2	3	2
		CO 4	Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms					2			3	2	2	3	1
		CO 5	Identify technology/research gaps and propose innovative/creative solutions	2	3	3	1	2							
		CO 6	Organize and communicate technical and scientific findings effectively in written and oral forms					2			2	2	3	1	1

KRISHNA KUMAR KOMALANGAN

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