K L UNIVERSITY

DEPARTMENT OF MECHANICAL ENGINEERING

2016-2020 BATCH Course Outcomes (COs)

S No	Course Code	Course Title	CO NO	Description of the Course Outcome
1	15MT1001	SINGLE VARIABLE MATRIX ALGEBRA	CO1	Model the physical laws and relations mathematically as a first order differential equations, solve by analytical and numerical methods also interpret the solution.
			CO2	Model physical laws and relations mathematically as second/higher order differential equations, solve by analytical method and interpret the solution.
			CO3	Obtain the Fourier series expansions of periodic functions and use the series to solve ordinary differential equations.
			CO4	Model physical problems mathematically as a system of linear equations and solve them by analytical and numerical methods. Also, determine the nature of Quadratic form using Eigen values.
			CO5	Verify the solution of problems through MATLAB.
2	15 PH 1001	ENGINEERING MATERIALS	CO1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.
			CO2	Understands magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.
			CO3	Understands thermal and mechanical properties of materials, heat treatment methods for changing the microstructure of materials and responses of materials subjected to load.
			CO4	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.
			CO5	Apply the knowledge on structure and properties of materials while executing experiments and develop inter disciplinary projects.
3	15CS1001	C PROGRAMMING AND DATA STRUCTURES-I	CO1	Illustrate how problems are solved using computers and programming.
			CO2	Interpret & Illustrate user defined C functions and different operations on list of data.
			CO3	Implement Linear Data Structures and compare them.
			CO4	Implement Binary Trees.
			CO5	Apply the knowledge obtained by the course to solve real world problems.
4	15GN1004	INTRODUCTION TO ENGINEERING	CO1	Understand the basic principles of engineering design
			CO2	Understand and analyze the possible career options in Engineering and develop strategic plan, career targets and mechanism to achieve the same.
			CO3	Understand the aspects of critical thinking and problem solving in engineering
			CO4	Apply to knowledge of critical thinking to frame real-world problems and provide basic solution approach to such problems from engineering perspective
			CO1	Understand the concept of forces and apply the static equilibrium equations.
			CO2	Analyze co-planar and non co-planar system of forces.

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5	15ME1001	MECHANICS	CO3	Apply the concept of centroid & centre of gravity to determine moment of inertia.
			CO4	Analyze the rigid bodies under translation and rotation with and without considering forces.
			CO5	Understand the engineering systems to prepare and demonstrate the models with the help of mechanics concept to solve the engineering problems.
6	15MT1203	MULTIVARIATE CALCULUS	CO1	Determine extreme values for functions of several variables
			CO2	Determine area, volume through multiples integrals
			CO3	Apply the concepts of vector calculus to calculate the gradient, directional derivative, arc length , areas of surfaces and volume of solids in practical problems
			CO4	Obtain analytical and numerical solutions of Heat and wave equations
			CO5	Verify the solution of problems through MATLAB
7	15ME1002	ENGINEERING GRAPHICS	CO1	Draft Orthographic views, projections of planes and , solidsmanually and by using CAD software Tool (AutoCAD)
			CO2	Drafting Sectional views , Isometric views ,development of surfaces and perspectives views manually and by using AutoCAD
			CO3	Project based workshop to prepare different models with the aid of workshop trades i.e., Carpentry, Tin smithy, House wiring and Fitting
8	15CY1001	ENGINEERING CHEMISTRY	CO1	Examine water quality and select appropriate purification technique for intended problem
			CO2	Predict potential complications from combining various chemicals or metals in an engineering setting
			CO3	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena
			CO4	Apply phase rule, polymers, conducting polymers and nano chemistry to engineering processes
			CO5	An ability to analyze & generate experimental skills
9	15GN1003	MEASURMENTS	CO1	Understand and apply the fundamentals of a measurement system, characteristics, transducers and metrology using simulation and experimentation tools.
			CO2	Understand various electrical & computer parameters, and apply different measuring techniques on various electrical parameters using simulation and experimentation tools.
			CO3	Understand electronic & electro-physiological parameters, and apply measuring techniques on electronic parameters using simulation and experimentation tools.
			CO4	Understand and apply different measuring techniques on civil and mechanical parameters using simulation and experimentation tools.
10	16 MT 1204	LOGIC AND REASONING	CO1	Apply the fundamental principle of counting and use them to measure the uncertainty in random experiments.
			CO2	Apply Venn diagrams to find the conclusion of statements, solve puzzles using binary logic and problems relating to cubes.
			CO3	Apply the available models for Data sufficiency & redundancy and interpret it , when given, in tabular and graphical forms.
			CO4	Apply the Reasoning techniques to solve problems on arrangements, series, analogies, coding and decoding.

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11	16ME2105	METALLURGY	CO1	Understand the significance of cooling curves and phase diagrams.
			CO2	Ability to understand various heat treatment processes.
			CO3	Identify fuels and furnaces used in metallurgical industries and to Understand the mineral processing basic principles.
			CO4	Acquires knowledge on extraction of metals, production of components using powder metallurgy technique.
			CO5	Identify and differentiate various types of materialsand understand various heat treatment method.
12	16MT2104	PROBABILITY AND NUMERICAL METHODS	CO1	Apply the conditional probability and discrete distributions to suitable real-world situations.
			CO2	Apply continuous distributions to suitable real- world situations and also analyze bivariate data using correlation and regression analysis.
			CO3	Test for means-single and two sample means
			CO4	Identify different mathematical problems and reformulate them in a way that is appropriate for numerical treatment .
13	16ME1003	THERMODYNAMICS	CO1	Understand the fundamentals of thermodynamic systems and processes.
			CO2	Apply first law of thermodynamics to various flow and non-flow processes.
			CO3	Apply second law of thermodynamics and principle of entropy to Engineering Devices.
			CO4	Apply principles of combustion for gravimetric and volumetric analysis of fuels.
			CO5	Plan and conduct simple experiments to demonstrate thermodynamic principles.
14	16ME2106	STRENGTH OF MATERIALS	CO1	Analyze stresses in members with 1D axial loading or torsion
			CO2	Analyze shear force and bending moment diagrams
			CO3	Analyze deflections and stresses in beams
			CO4	Design columns and pressure vessels
			CO5	Apply the theoretical concepts to conduct various experiments of strength of materials practically and analyze the data
15	16ME2108	MANUFACTURING TECHNOLOGY	CO1	Understand and appreciate the breadth and depth of the field of manufacturing technology.
			CO2	Understand various casting procedures and melting practices used for producing different products.
			CO3	Understand various special casting approaches used for producing precision components.
			CO4	Understand various welding methods for joining metals and alloys.
			CO5	Gain hands on experience in converting a given raw material into desired shape and size by applying suitable casting and welding processes.

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16	16ME2104	FLUID MECHANICS & HYDRAULIC MACHINES	CO1	Understand physical laws related to fluid statics and buoyancy.
			CO2	Apply continuity, Euler's and Bernoulli's equations in various fluid flow situations.
			CO3	Understand and apply momentum equation and boundary layer concepts to flow through pipes and to impact of jets.
			CO4	Apply fluid dynamical principles to hydraulic machines.
			CO5	Conduct experiments on various hydraulic machines like turbines and pumps
17	16ME 2210	KINEMATICS OF MACHINES	CO1	Identify various possible 4 link mechanisms and their inversions and applicability
			CO2	Analyze mechanisms kinematically using velocity and acceleration diagrams
			CO3	Analyze cam profiles and the motion of their followers
			CO4	Analyze gears and gear trains kinematically
			CO5	Apply the theoretical concepts to conduct various experiments to Analyze Mechanism , gear trains and draw Cam Profile.
18	17 MT 2002	COMPLEX VARIABLES AND TRANSFORMS	CO1	Apply Cauchy-Riemann equations to test the analyticity of a complex function and Compute the complex integrals, using Cauchy theorem and Cauchy Integral formulae.
			CO2	Represent analytic functions as Taylor, Maclaurine and Laurent series expansions and compute real and complex integrals using the Residue theorem. Also transform complex functions using bilinear transformation.
			CO3	Apply Laplace transform techniques to solve differential equations
			CO4	Compute Fourier transforms using integrals and solve differential equations
19	16ME 2211	METAL CUTTING AND METAL FORMING	CO1	Understand the theoretical background of metal cutting.
			CO2	Understand and estimate the economics of machining various processes.
			CO3	Understand the theory of metal forming in shaping of components.
			CO4	Understand and estimate the loads in various metal forming processes.
20	16ME 2212	VAPOUR POWER SYSTEMS	CO1	Understand the properties of pure substance and evaluate the Rankine cycle efficiency for regenerative and binary vapor power cycles.
			CO2	Understand the working principles of steam generators and steam nozzles.
			CO3	Evaluate the performance of steam turbines and condensers.
			CO4	Understand the principles of refrigeration and psychrometry.
			CO5	Experimental verification of various vapour power devices.
			CO1	Understand different types of fasteners and draft various types of joints, locking arrangements.

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21	16ME2207	MACHINE DRAWING	CO2	Understand and draft various types of couplings and their arrangements and model the same using Solid works
			CO3	Prepare the assembly drawing of engine parts, machine Components both in conventional form and then by using software.
			CO4	Generate detail drawings of individual parts of an assembled machine Component both in conventional form and then by using software.
22	15EE2202	BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING	CO1	Understand basics of DC circuit analysis, fundamentals of AC and introduction three phase circuits
			CO2	Understand construction & working principle of DC Machines
			CO3	Understand construction & working principle of Transformer, three phase and single phase induction motor.
			CO4	Understand number systems and their conversions, characteristics of PN junction diode
			CO5	Conduct an experiment to analyze the performance of various electrical and electronic devices and draw their char characteristics.
23	15 EN 2103	PROFESSIONAL COMMUNICATION SKILLS	CO1	Apply the various strategies of presentation Skills.
			CO2	Analyze the given topics and situations and applying the strategies of group discussion.
			CO3	Analyze the basic concepts of critical and analytical reading skills.
			CO4	Apply the strategies of sentence formation and sentence completion.
24	15EN3206	CORPORATE COMMUNICATION SKILLS	CO1	Analyse the method of identifying synonyms and antonyms and analyze the meaning of a word from the context.
			CO2	Analyze various strategies involved in writing an essay and apply various styles in writing.
			CO3	Analyse the organization of the passage and also analyze the tone, attitude and style of the author.
			CO4	Acquire knowledge on various employability skills & analyze a situation and develop adaptability.

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25	16ME 3114	GAS POWER SYSTEMS	CO1	Understand thermodynamic relations to ideal and real gas problems.
			CO2	Understand the working principles of reciprocating air compressors and evaluate their performance.
			CO3	Understand the working principle of rotary compressors and evaluate their performance.
			CO4	Understand the operating principles of gas turbine and jet propulsion and evaluate their performance.
			CO5	Conduct experiments on reciprocating and rotary machines.
26	16ME 3115	DYNAMICS OF MACHINES	CO1	Analyze the static and dynamic forces of planar mechanisms and flywheels
			CO2	Analyze the static and dynamic balancing of rotating as well as reciprocating masses due to unbalanced forces
			CO3	Understand the free and forced vibrations of single degree freedom systems
			CO4	Analyzethe gyroscope and governor mechanisms for controlling the moving vehicles
			CO5	Apply the theoretical concepts to mechanisms by using the simulation software and analyzing the data
27	16ME 3116	MACHINE TOOLS AND METROLOGY	CO1	Understand the working of standard machine tools such as lathe, milling, drilling, grinding, and allied machines.
			CO2	Understand and principles and design considerations of jigs and fixtures used in various machining operations.
			CO3	Understand the procedures to measure the geometrical details of various mechanical elements and assemblies using linear and angular measuring instruments.
			CO4	Understand the procedures to measure the surface roughness and roundness of given mechanical components.
			CO5	Gain hands on experience on usage of various machining processes to convert a given raw material into desired shape and size and to measure the geometrical and surface quality of the mechanical components.
28	16ME 3117	INTERNAL COMBUSTION ENGINES	CO1	Analyze various air standard cycles and their performance
			CO2	Understand the working principles of 2-stroke and 4-stroke engines, SI and CI Engines.
			CO3	Understand fuel supply system and combustion phenomenon in SI and CI Engines.
			CO4	Analyze and evaluate performance of SI and CI Engines.
			CO5	Conduct experiments on SI and CI Engines, analyze and interpret the experimental data and observations.
29	16ME 3118	OPERATIONS RESEARCH	CO1	Identify Optimum solutions for various single objective problems using Linear Programming models.
			CO2	Identify Optimum Solutions through Transportation and Assignment models
			CO3	Identify Optimum Solutions through Game theory, DPP, Queuing theory & Simulation models
			CO4	Solve project management problems using CPM, PERT and Crashing

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			CO5	Solve Various Linear Programming, Transportation, Assignment, Game Theory and Simulation models through POM Software
30	16ME 3219	ROBOTICS	CO1	Understand the concept of robotics with respect to their anatomy, classification end effectors.
			CO2	Analyze a suitable sensors for robotic system design with respect to their applications.
			CO3	Ability to solve the kinematics for robot manipulator
31	16ME 3220	HEAT TRANSFER	CO1	Understand laws of heat transfer and apply Fourier law of conduction for one dimensional heat conduction to engineering problems.
			CO2	Analyze steady state conduction problems involving internal heat generation and extended surfaces and one dimensional unsteady state heat conduction problems.
			CO3	Apply principles of convection, boiling and condensation and evaluate convective heat transfer coefficient for different flow situations.
			CO4	Design of heat exchangers; Understand principles of radiation and evaluate radiative heat transfer between two bodies.
			CO5	Conduct experiments and demonstrate heat transfer phenomena involving conduction, convection and radiation.
32	16ME 3221	DESIGN OF MACHINE ELEMENTS	CO1	Understand the basics concepts, analyze the different stresses and apply design principles for static and fatigue strength of machine elements
			CO2	Design the appropriate fastening technique
			CO3	Design the power transmission elements such as keys, shafts and couplings
			CO4	Design the appropriate springs such as helical or leaft springs
			CO5	Analyze machine elements using ANSYS software
33	16ME 3222	COMPUTER INTEGRATED MANUFACTURING	CO1	Understand the basic fundamentals of computer aided design and manufacturing.
			CO2	Explain the basic concepts of NC and CNC programming in machining.
			CO3	Learn the basic concepts of group technology and flexible manufacturing systems.
			CO4	Learn the basic concepts of computer aided process planning.
			CO5	Gain hands on experience in converting a given raw material into desired shape and size by applying suitable casting and welding processes.

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34	16ME 3223	PRODUCTION AND OPERATION MANAGEMENT	CO1	Apply various work-study techniques to determine the standard time and efficiency.
			CO2	Analyze various quality control techniques for bringing out the best quality output.
			CO3	Apply various production scheduling techniques to optimize productivity & Forecast the future demand for the product
			CO4	Apply various strategies to optimize the Inventory cost
			CO5	Validate the theoretical concepts by doing the experiments in the laboratory
35	17 MB 4057	ECONOMICS FOR ENGINEERS	CO1	Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio
			CO2	Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions
			CO3	Compute the depreciation of an asset using standard depreciation techniques to assess its impact on present or future value
			CO4	Apply all mathematical approach models covered in solving engineering economics problems
36	16ME 4124	MECHATRONICS	CO1	Understand the role of sensors and transducers for control systems
			CO2	Apply the concepts of control systems in the field of automation.
			CO3	Acquire ability to analyze and simulate response of a control systems
			CO4	Apply the principles of PLCs in the design of control systems to achieve desired performance characteristics
			CO5	Modelling of different systems with the help of control systems concepts and controllers to solve the engineering problems.
37	16ME 4125	DESIGN OF TRANSMISSION ELEMENTS	CO1	Design and selection of various belt and chain drives
			CO2	Design and Selection of the suitable bearing for the given loading condition
			CO3	Analyze kinematic and dynamic aspects in design of brakes, clutches and IC engine components
			CO4	Design and analysis of different types of gear drives
			CO5	Analyze machine elements using analysis software
38	17GN1001	ECOLOGY AND ENVIRONMENT	CO1	Understand the importance of Environmental education and conservation of natural resources.
			CO2	Understand the importance of ecosystems and biodiversity.
			CO3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process.

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39	15GN1002	HUMAN VALUES	CO1	realize and understand the basic aspiration, harmony in the human being.
			CO2	envisage the roadmap to fulfill the basic aspiration of human beings.
			CO3	analyze the profession and his role in this existence.
40	16ME 4051	ADVANCED STRENGTH OF MATERIALS	CO1	Analyze Statically Indeterminate Beams
			CO2	Analyze Curved Beams and Beams subjected to Unsymmetrical bending
			CO3	Apply Energy methods to find deflections in simple Structures
			CO4	Analyze Stresses in Rotating members and Thick cylinders
41	16ME 4052	FINITE ELEMENT METHOD	CO1	Analyze 3D stresses & strains for general loading and solving complex engineering problems using approximate methods
			CO2	Analyze 1D structural problems using FEM
			CO3	Analyze 2D problems including axi-symmetric solids subjected to axi-symmetric loading using FEM
			CO4	Analyze thermal problems structural dynamic problems using FEM
42	16ME 4053	ADVANCED VIBRATIONS AND NOISE CONTROL	CO1	Understand the concepts of acoustics and vibrations
			CO2	Determine the sources of vibrations
			CO3	Measure the level of vibration and control the vibrations
			CO4	Measure and control the noise observed from vehicles.
43	16ME 4054	COMPUTER AIDED DESIGN	CO1	Understand the Fundamentals of CAD and display devices
			CO2	Apply the concept of geometric modeling
			CO3	Able to apply concept of Surface and solid modeling
			CO4	Application of various Geometric transformations
44	16ME 4055	CONDITION MONITORING	CO1	Understand the types of Maintenance Techniques
			CO2	Diagnose fault through Vibration Monitoring
			CO3	Interpret the Faults through Thermal Monitoring or Lubricant Analysis
			CO4	Apply sensors for condition monitoring

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45	16ME 4056	CREEP FATIQUE AND FRACTURE MECHANICS	CO1	Assess the failure of unflawed structural components
			CO2	Assess the fatigue life of structural components under the specified load spectrum
			CO3	Evaluate the fracture toughness and assess the life of flawed structural components
			CO4	Assess the life of structural components under creep
46	16ME 4057	THEORY OF ELASTICITY AND PLASTICITY	CO1	Analyze stresses and strains in planes in elastic or plastic region
			CO2	Solve 2-D problems in rectangular Components
			CO3	Analyze stresses and strains in 3-D problems
			CO4	Analyze Beams and frames in plasticity applications
47	16ME 4058	MECHANICS OF COMPOSITE MATERIALS	CO1	Know the composite materials and manufacturing methods
			CO2	Understand the behaviour of composite Lamina
			CO3	Know the properties of various types composite materials
			CO4	Apply Failure theories to calculate stresses in composite materials
48	16ME 4061	MODREN MANUFACTURING PROCESSES	CO1	To classify and understand the need of Non-Traditional Manufacturing Processes.
			CO2	To understand the working principle, mechanism of metal removal and the effect of various process parameters on its performance of various Non-Traditional Machining Processes.
			CO3	To understand the working principle and the effect of various process parameters on its performance of various Non-Traditional Welding Processes.
			CO4	To understand the working principle of various Non-Traditional Forming Processes.
49	16ME 4062	ADVANCED MATERIALS	CO1	Ability to identify different types of optimization problems
			CO2	Understand basic concepts in solving nonlinear optimization problems
			CO3	Understand optimality conditions for unconstrained and constrained optimization problems and be able to apply them in verifying the optimality of a solution
			CO4	Understand basics of choosing and implementing optimization methods

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50	16ME 4063	ADDITIVE MANUFACTURING	CO1	To be able to properly distinguish between the hype and realities of additive manufacturing
			CO2	To understand the basic AM processes, and the limitations and advantages of each.
			CO3	To understand the differences between traditional processes and additive manufacturing production, including the differences in design methodology.
			CO4	To use AM terminology properly and understand the role and importance of standards in the additive manufacturing industry.
51	16ME 4064	AUTOMATION IN MANUFACTURING	CO1	Understand the strategies and components of automation in productions.
			CO2	Analyze the automated flow lines in production systems.
			CO3	Analyze and design the assembly lines and materials handling systems of production systems.
			CO4	Develop the adoptive system for a machine cell.
52	16ME 4065	TOOL ENGINEERING AND DESIGN	CO1	Develop the ability to design cutting tools for given single component.
			CO2	Design and development of various die configurations.
			CO3	Design and development of jigs for given component.
			CO4	Design and development of fixtures for given component.
53	16ME 4066	FLEXIBLE MANUFACTURING SYSTEMS	CO1	Analyze various production schedules and plant layouts.
			CO2	Apply the concept of group technology to the development of FMS.
			CO3	Identify hardware and software components of FMS.
			CO4	Analyze materials handling and storage system in FMS.
54	16ME 4067	SMART MATERIALS	CO1	Understand the behavior and applicability of Piezoelectric materials in designing smart structures and materials.
			CO2	Understand the behavior and applicability of Shape memory alloys in designing smart structures and materials.
				Understand the behavior and applicability of Electro active polymers in designing smart structures and materials.
			CO3	Understand the behavior and applicability of Magnetostrictive materials in designing smart structures and materials.
55	16ME 4068	MACHINE TOOL DESIGN	CO1	Understand basic motions involved in a machine tool.
			CO2	Design machine tool structures.
			CO3	Design and analyze systems for specified speeds and feeds.
			CO4	Select subsystems for achieving high accuracy in machining.

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56	16ME 4071	REFRIGERATION & AIR-CONDITIONING	CO1	Analyze COP of different refrigeration cycles with different methods of refrigeration using different refrigerants.
			CO2	Analyze the performance of Vapor Compression Refrigeration with modification of cycle and its components.
			CO3	Understanding the working of Cascade systems for low temperature Production and of VAR system.
			CO4	Analyze cooling load for comfort and industrial air conditioning on basis of processes on psychometric charts and its components.
57	16ME 4072	NON-CONVENTIONAL ENERGY SOURCES	CO1	Understand and analyze various solar thermal applications.
			CO2	Analyze the performance of tidal, wave and Ocean thermal energy conversion (OTEC) systems
			CO3	Understand and analyze the operation of wind, geothermal, biomass and bio-gas power generation.
			CO4	Understand and analyze the operation of solar photovoltaic cells fuel cells and the phenomenon of fusion.
58	16ME 4073	POWER PLANT ENGINEERING	CO1	Understand the working of system and subsystems of Hydro Electric and Diesel power plants.
			CO2	Understand the working of system and subsystems of Thermal and nuclear power plants and to draw their layout diagrams
			CO3	Calculate the various factors of power plant economics and understand power generation through Non-conventional energy sources.
			CO4	Understand various direct energy conversion systems, pollution and methods to control pollution.
59	16ME 4074	AUTOMOBILE ENGINEERING	CO1	Understand different types of chassis, engine components, fuel systems and its working principles
			CO2	Understand different components of transmission system, cooling and lubrication systems
			CO3	Understand different components of suspension, steering and braking systems
			CO4	Understand different electric and electronic systems used in automobiles and pollution control techniques used in SI and CI engines.
60	16ME 4075	ADVANCED THERMODYNAMICS	CO1	Understanding the concepts of exergy, thermodynamic potential and calculation of exergy of a system
			CO2	Understanding kinetic theory of gases and intermolecular forces
			CO3	Understanding various methods of statistical distribution of particles
			CO4	Ability to construct figures for particle allocations depending on various probability disrtibutions
61	16ME 4076	RENEWABLE ENERGY TECHNOLOGY	CO1	Understand different types of Renewable Energy Sources and Analyzing the energy production.
			CO2	Understand the principles of OTEC and wind energy and analyze wind speed effects in power generation.
			CO3	Understand different conversion techniques of biomass to useful fuel or energy.
			CO4	Understand different conversion techniques of Geo-Thermal energy.

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62	16ME 4077	COMPRESSIBLE FLUID FLOW	CO1	To understand and apply compressible flow theory in various propulsion devices.
			CO2	To solve the gas dynamics design problems related to high speed aerodynamics, rocket and missile propulsion, steam and gas turbines, and high speed turbo-compressors.
			CO3	To acquire knowledge on the measuring devices and techniques being used in compressible flows.
			CO4	To understand various aspects of the wave phenomena including the normal and oblique shock waves.
63	16ME 4078	HEAT PIPE: THEORY, DESIGN& APPLICATIONS	CO1	Understand the working principle and operational characteristics of heat pipes
			CO2	Understand and interpret the heat pipe operating limits while modeling heat pipes for practical applications
			CO3	Understand design and manufacturing considerations of heat pipes for a given industrial application
			CO4	Develop Designs for different applications including thermal management of electronic devices, space applications, power plant heat exchangers and HVAC equipment
64	16ME 4081	AUTOMOTIVE SENSOR AND APPLICATIONS	CO1	Learn the sensor classification and sensor product selection guide.
			CO2	Analyze the measurement of engine parameter using sensor.
			CO3	Apply required sensors and actuators for automotive applications
			CO4	Analyze the sensors for intelligent transport systems
65	16ME 4082	AUTOTRONICS	CO1	Understand the automotive electronics for engine management system
			CO2	Analyze required sensors and actuators for an automotive application
			CO3	Apply the suitability of a control system for automotive application
			CO4	Ability to analyze of electronic system for automotive applications

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66	16ME 4083	ELECTRONIC ENGINE MANAGEMENT SYSTEM	CO1	Understand the automotive instruments and automotive sensors
			CO2	Learn the measurement of engine parameter by using sensor.
			CO3	Acquire ability to analyze the electronic fuel injection system
			CO4	Apply the principles of digital control techniques and the application of on board diagnosis
67	16ME 4084	INSTRUMENTATION IN AUTOMOTIVE INDUSTRIES	CO1	Understand the knowledge of various Measuring Instruments to design a simple Instrumentation system
			CO2	Analyze the various instruments and use them in various fields
			CO3	Learn and apply the measuring instruments in various industries application
			CO4	Analyze suitable instrument for a given application
68	16ME 4085	MECHATRONICS SYSTEM DESIGN	CO1	Understand the approach used for mechatronic system design and relevant considerations
			CO2	Applythe suitable sensors and actuators used in a Mechatronic system
			CO3	Analyze signal conditioning interface in a Mechatronic system and implementation of control systems
			CO4	Modeling and Simulation for the Mechatronic System design perspective
69	16ME 4091	ARTIFICIAL INTELLIGENCE FOR ROBOTICS	CO1	Understand the concepts of AI
			CO2	Apply basic principles of AI in solutions that require problem solving and planning.
			CO3	Apply basic principles of AI in solutions that require problem solving, planning, reasoning and learning
			CO4	Analyze AI in Robotics
70	16ME 4092	AUTOMATION SYSTEM DESIGN	CO1	Understand the design principles of automation and its application in an automated manufacturing system
			CO2	Analyze pneumatic sub-systems of an automated manufacturing system in terms of design, operation and control aspects
			CO3	Analyze hydraulic sub-systems of an automated manufacturing system in terms of design, operation and control aspects
			CO4	Understand programmable automation with regard to the computer integrated manufacturing system
71	16ME 4093	INDUSTRIAL AUTOMATION AND CONTROL	CO1	Understand the concepts industrial automation and measurement systems
			CO2	Apply the controllers in automation
			CO3	Analyze and select a suitable PLC system for the given application
			CO4	Apply the concepts of control systems for industrial automation

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72	16ME 4094	INDUSTRIAL HYDRAULIC AND PNEUMATIC SYSTEMS	CO1	Learn the concepts hydraulic or pneumatic actuation system
			CO2	Analyze diagnose maintenance problems of hydraulic and pneumatic system
			CO3	Analyze required components to develop an automation system using pneumatics and hydraulic system
			CO4	Develop circuits for controlling hydraulic and pneumatic using PLC
73	16ME 4095	INDUSTRIAL ROBOTICS AND MATERIAL HANDLING SYSTEMS	CO1	Understand the concepts of robot,sensors and their applications in robots
			CO2	Learn material handling equipment used both in automated and non-automated systems
			CO3	Analyze and select a suitable material handling system for the given application
			CO4	Apply the various applications of robots in material handling
74	16ME 40A1	AIRCRAFT SYSTEMS DESIGN	CO1	Understand the Design process of Aircraft
			CO2	Determine the forces in Aircraft structures
			CO3	Select the aircraft materials for manufacturing processes
			CO4	Analyze stresses in Aircraft structures
75	16ME 40A2	PRODUCT DESIGN AND DEVELOPMENT	CO1	Understand the principles of creativity in Design
			CO2	Analyze Economics in Design
			CO3	Apply Modelling techniques for a product
			CO4	Determine the cost of product and know the significance to product design
76	16ME 40A3	BIOMECHANICS OF TISSUES AND JOINTS	CO1	Understand the concepts of Biomechanics
			CO2	Apply biomechanics to analyse Tissues and structural systems
			CO3	Analyze joints using Biomechanics theory
			CO4	Apply kinematic mechanisms to human motion
77	16ME 40A4	MECHATRONICS	CO1	Identify appropriate sensors and actuation system for a given application.
			CO2	Identify appropriate microcontroller for a given application and to build a mathematical Model of system for evaluating open loop system performance and behavior.
			CO3	Suggest an appropriate closed loop control strategy to attain the desired system behavior.
			CO4	Suggest a Mechatronic product design for a given application and evaluate its performance.

S No	Course Code	Course Title	CO NO	Description of the Course Outcome
78	16ME 40A5	ROBOTICS	CO1	Understand the concept of robotics with respect to their anatomy, classification end effectors.
			CO2	Analyze a suitable sensor for robotic system design with respect to their applications.
			CO3	Analyze control system for robot control
			CO4	Ability to select the robot configuration for robot applications
79	16ME 40A6	CONDITION MONITORING	CO1	Understand the types of Maintenance Techniques
			CO2	Diagnose fault through Vibration Monitoring
			CO3	Interpret the Faults through Thermal Monitoring or Lubricant Analysis
			CO4	Apply sensors for condition monitoring
80	16ME 5001	ADVANCED HEAT & MASS TRANSFER	CO1	Understand 1-D steady state conduction heat transfer
			CO2	Apply principles of Heat Transfer to develop Mathematical model for ducts and plates
			CO3	Analyze free and forced convection problems
			CO4	Apply concepts of radiation heat transfer for enclosure analysis
81	16ME 5003	INCOMPRESSIBLE AND COMPRESSIBLE FLOWS	CO1	Understand the fundamental concepts of continuum mechanics and shock wave theory
			CO2	Apply techniques for analyzing inviscid incompressible flow problem
			CO3	Apply techniques for analysis of laminar and turbulent boundary layer flows
			CO4	Apply techniques for analysis of unsteady compressible flows.
82	16ME 5002	COMPUTATIONAL FLUID DYNAMICS	CO1	Understand Fundamentals of CFD and Derive the governing equations
			CO2	Apply different CFD techniques to diffusion
			CO3	Application of time integration methods for convection diffusion
			CO4	Solving N-S equations and Modeling of turbulence

S No	Course Code	Course Title	CO NO	Description of the Course Outcome
83	16ME 5004	MECHANISMS DESIGN AND SIMULATION	CO1	Understand Kinematic principles and Structures
			CO2	Analyze mechanisms in linkages Robotic manipulator
			CO3	Draw Inflection circle for coupler curves
			CO4	Synthesize curve based mechanism and Cam mechanisms
84	16ME 5005	ADVANCED MECHANICS OF SOLIDS	CO1	Analyze Stress, strain in a deformable bodies
			CO2	Apply Energy Methods to calculate deflections in members
			CO3	Analyze Stresses, deflections in Straight and Curved beams
			CO4	Determine contact stresses and deflection of bodies in contact
85	16ME 3126	INDUSTRIAL ENGINEERING TECHNIQUES	CO1	Apply various work-study techniques to determine the standard time and efficiency.
			CO2	Analyze various quality control techniques for bringing out the best quality output.
			CO3	Apply various production scheduling techniques to optimize productivity & Forecast the future demand for the product
			CO4	Apply various strategies to optimize the Inventory cost
86	16ME 3118	OPERATIONS RESEARCH	CO1	Identify Optimum solutions for various single objective problems using Linear Programming models
			CO2	Identify Optimum Solutions through Transportation and Assignment models
			CO3	Identify Optimum Solutions through Game theory, DPP, Queuing theory & Simulation models
			CO4	Solve project management problems using CPM, PERT and Crashing
87	16ME 3127	ENGINEERING MANAGEMENT	CO1	Apply various management concepts to solve real life problems
			CO2	Analyze various Economic Evaluation of alternatives and Depreciation methods
			CO3	Analyze various quality control techniques for bringing out the best quality output.
			CO4	Apply various strategies to optimize the Inventory cost
88	16ME 3128	WORK STUDY & ERGONOMICS	CO1	Calculate the basic work content of a specific job for employees of an organization. Thereby they will be able to calculate the production capacity of man power of an organization.
			CO2	Analyze the existing methods of working for a particular job and develop an improved method through questioning technique by using various recording techniques
			CO3	Apply ergonomic principles in the workplace or other environment
			CO4	Apply various plant layout and production systems to optimize productivity.

S No	Course Code	Course Title	CO NO	Description of the Course Outcome
89	16ME 3129	OPERATIONS MANAGEMENT	CO1	Calculate future demand for the product in the market by applying appropriate forecasting technique.
			CO2	Apply various plant layout and production scheduling techniques to optimize productivity.
			CO3	Apply various production scheduling techniques to improve productivity.
			CO4	Analyze various quality control techniques for bringing out the best quality output.