

K L E F				
DEPARTMENT OF MECHANICAL ENGINEERING				
2020-2024 BATCH Course Outcomes (COs)				
S No	Course Code	Course Title	CO NO	Description of the Course Outcome
1	20UC1101	INTEGRATED PROFESSIONAL ENGLISH	CO1	Understand the concepts of grammar to improve communication, reading, and writing skills
			CO2	Demonstrate required knowledge over Dos and Don'ts of speaking in the corporate context. Demonstrate ability to face formal situations / interactions.
			CO3	Understand the varieties of reading and comprehend the tone and style of the author. Skim and scan effectively and appreciate rhetorical devices
			CO4	Apply the concepts of writing to draft corporate letters, emails, and memos
2	20UC1202	ENGLISH PROFICIENCY	CO1	Demonstrating different interpersonal skills for employability
			CO2	Distinguishing business essential skills
			CO3	Classifying social media and corporate communication skills
			CO4	Applying analytical thinking skills
3	20UC2103	PROFESSIONAL COMMUNICATION SKILLS	CO1	Developing critical and analytical reading skills
			CO2	Discovering different interpersonal skills to develop people skills
			CO3	To enhance the problem-solving skills of the students through the concepts of Simple Equations, Ratio, Proportion & Variation, Percentages, Profit & Loss, Averages, Allegations, Simple & Compound Interest.
			CO4	Apply diagrammatic representation of the given data to find the possible outcomes in the topics of Deductions, Cubes, Venn Diagrams and Arrangements
4	20UC2204	CORPORATE COMMUNICATION SKILLS	CO1	To distinguish product and process and quote them in speaking and writing activities
			CO2	To apply interpersonal skills
			CO3	To enhance the problem-solving skills of the students through the concepts of Numbers, Time & Work, Time & Distance, Permutations & Combinations, Probability which will enable them to improve their problem solving abilities which in turn improve their programming skills.
			CO4	To apply known facts to find the unknowns in the topics Clocks, Calendars, Binary Logic. Identify the rule set by analyzing the given observations in the topics Series, Analogy, Odd Man, Coding-Decoding
5	20UC3005	APTITUDE BUILDER	CO1	To discuss and interpret English language skills necessary for placements
			CO2	To demonstrate skills to get selected in interviews and retain job
			CO3	To enhance the problem-solving skills of the students through the concepts of Mensuration, Quadratic Equations & Inequalities, Progressions, Logarithms, Data Interpretation, Data Sufficiency which will enable them to improve their problem-solving abilities which in turn improve their programming skills.
			CO4	To apply deductive logic to solve questions in Connectives, Blood relations, Ranking and time sequence, Symbols and notations. Apply principles of reflection and rotation to solve picture puzzles.
		INDIAN HERITAGE	CO1	To familiarize with various aspects of the culture and heritage of India through ages.
			CO2	To acquaint with the contributions of Indians in the areas of languages and literature, religion and philosophy

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6	20UC0007	INDIAN HERITAGE AND CULTURE	CO3	To understand the Social structure and the spread of Indian culture abroad
			CO4	To know the development of Science and Technology in India through ages and to appreciate the contributions of some of the great Indian scientists
7	20UC0008	INDIAN CONSTITUTION	CO1	To understand Constitutional development after Independence
			CO2	To learn the fundamental features of the Indian Constitution
			CO3	To get a brief idea of the powers and functions of Union and State Governments
			CO4	To understand the basics of working of Indian Judiciary and the Election Commission
8	20UC0009	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
			CO4	Understand the importance of Environmental education and conservation of natural resources
9	20UC0010	UNIVERSAL HUMAN VALUES & PROFESSIONAL ETHICS	CO1	Understand and identify the basic aspiration of human beings
			CO2	Envisage the roadmap to fulfill the basic aspiration of human beings.
			CO3	Analyze the profession and his role in this existence.
10	20UC0011	ENTREPRENEURSHIP	CO1	Analyze the business environment in order to identify business opportunities,
			CO2	Identify the elements of success of entrepreneurial ventures
			CO3	Consider the legal and financial conditions for starting a business venture
			CO4	Evaluate the effectiveness of different entrepreneurial strategies
11	20MT1101	MATHEMATICS FOR COMPUTING	CO1	Model a system of equations for real world applications in engineering, physical and biological sciences, computer science, finance, economics and solve them through matrix algebra
			CO2	Model basic and computational techniques on discrete structures like relations, orders, functions & FSM, Lattices, and propositional & predicate logic
			CO3	Model real world structures and their related applications using advanced discrete structures like graphs and trees.
			CO4	Model the given Statistical data for real world applications in Engineering science, Economics and Management.
			CO5	Demonstrate the Aptitude and Reasoning skills (Tests in skilling hours)
12	20SC1102	INTRODUCTION TO DESIGN	CO1	Be able to understand elements and principles of design
			CO2	Able to grasp stage model of action cycle
			CO3	Be able to understand design laws and their importance in design field
			CO4	To comprehend various rules of composition of design
			CO5	To gain hands-on experience of fundamentals of design
13	19MT2102	MATHEMATICS FOR ENGINEERS	CO1	Apply differential and integral calculus to find maxima & minima of functions, evaluate the integrals and solve the differential equations.
			CO2	Demonstrate the Fourier series and Laplace transforms.
			CO3	Describe probability, Random Variables
			CO4	Explain complex variables, analytic functions and introduction to stochastic process and Algebraic structures.
			CO1	Apply the concept of forces, governing static equations and analyze planer system of forces.

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14	20PH1010	MECHANICS	CO2	Use analytical techniques for analyzing forces in statically determinate structures.
			CO3	Understanding the concepts of planar and non-planar system of parallel forces and analyzing them. Estimate moment of inertia of lamina and material bodies
			CO4	Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems
15	20SC1203	USER CENTRIC DESIGN TECHNIQUES	CO1	Understand the different roles and responsibilities in phases of User centered Design
			CO2	Identify user pain points and opportunity areas through empathy and collaborative design
			CO3	To be able to design a better User Experience using UCD and 6D process
16	20SC2104	DESIGN THINKING AND INNOVATION	CO1	Understand the basics of design thinking and its implications in product or service development
			CO2	Understand and Analyze the requirements of a typical problem
			CO3	Plan the necessary activities towards solving the problem through ideation and prototyping
			CO4	evaluate the solution and refine them based on the customer feedback
17	20PH2007	MATERIALS FOR MECHANICAL ENGINEERING APPLICATIONS	CO1	Understand crystal structures and also to find lattice parameters using different XRD techniques
			CO2	Understand different heat treatment processes and also understand the properties of smart materials
			CO3	Understand different types of semiconducting materials and ceramic materials
			CO4	Understand different types of composite materials and nano materials and its applications
18	19BT1001	BIOLOGY FOR ENGINEERS	CO1	Acquire the Knowledge of basic biology
			CO2	Acquire the Knowledge of Human Biological Systems
			CO3	Acquire Knowledge on Microorganisms and Biosensors
19	20SC1101	COMPUTATIONAL THINKING FOR DESIGN	CO1	Design Basic and Complex Building Blocks for real world problems using structured programming paradigm.
			CO2	Translate computational thinking into Logic Design for Solving real world problems.
			CO3	Apply and Analyse CRUD operations on Basic Data Structures using Asymptotic Notations.
			CO4	Apply and Analyse CRUD operations on Linear Data Structures using Asymptotic Notations.
			CO5	Apply the structured programming paradigm with logic building skills on Basic and Linear Data Structures for solving real world problems.
20	20ME1103	DESIGN TOOLS WORKSHOP -I	CO1	Practice design thinking by developing artistic skills, Visualize and complete his/her innovative design by final drafting using 3D modeling
			CO2	Understand the concept of web page, web browser, web server, and able to create Static webpages
			CO3	Understand the concept of report writing using a markup language Latex
			CO4	Understand the concept of data visualization and creating data visualization dashboards, Understand the basic concept of VR/AR.
			CO1	Apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.
			CO2	Analyze and compare linear data structures and analyze different searching and hashing techniques

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21	19SC1202	DATA STRUCTURES	CO3	Analyze and compare various non – linear data structures like Trees and Graphs
			CO4	Analyze and compare various sorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.
			CO5	Execute lab experiments and develop a small project along with his/her team members.
22	19SC1209	DESIGN TOOLS WORKSHOP -II	CO1	Practice the design ideology by artistic skill
			CO2	Visualize the design ideology by using VR technology
			CO3	Visualize the design ideology by incorporating VR technique
			CO4	Visualize and present his design idea by applying AR technique
23	20ME1203	COMPUTATIONAL THINKING AND DATA SCIENCES	CO1	Perform basic computations in Python, including working with tabular data.
			CO2	Understand basic probabilistic simulations, statistical thinking and Stochastic Programs
			CO3	Use good practices in Python programming using Computational Simulations
			CO4	Implement Computational data modeling and clustering using Python programming.
			CO5	Apply the theoretical concepts to develop Python Programs to solve Optimization Problems and Computational Simulations with the applications of Solid and Fluid Mechanics concepts.
24	20ME1002	2D MODELING OF PHYSICAL SYSTEMS USING CAD TOOLS	CO1	Construct and Interpret drawing scale to visualize the geometries of Engineering objects using points, lines both manually and by AutoCAD / Fusion 360
			CO2	Draw projection of planes, solids and Generate the sectional views of solids both manually and by AutoCAD / Fusion 360
			CO3	Draw Engineering curves and develop the lateral surface of solids both manually and by AutoCAD / Fusion 360
			CO4	Build orthographic projections, create isometric sketches and identify standard features both manually and by AutoCAD / Fusion 360
25	20ME2104	3D MODELING AND PHYSICAL PROTOTYPING OF MECHANICAL COMPONENTS	CO1	Draft various parts of machine components and their assemblies. Conversion of part drawings to assembly drawing and vice versa in conventional form, Draw different line types and various dimensioning, conventional representation of materials and machine components, sectioning, limits, fits and tolerances
			CO2	Develop and interpret production drawing for various machine elements, Implement Computer Aided Drafting for various machine components using software.
			CO3	Understand different manufacturing techniques and their relative advantages / disadvantages with respect to different applications and Fabricate components physically using various tools and machines
			CO4	Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes, Assemble different components and produce small devices of their interest
26	20ME2209	NUMERICAL COMPUTATION FOR MECHANICAL ENGINEERS	CO1	Understand elementary programming concepts, and the basics in MATLAB
			CO2	Understand linear algebra, probability and statistics for solving engineering problems
			CO3	Solve a system through linear and nonlinear equations, and ordinary differential equations in Mechanical Engineering
			CO4	Select an appropriate numerical approach for solving engineering problems

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			CO5	Ability to select bench marks to confirm the computational approach
27	20EE2205	CIRCUITS AND ELECTRONICS	CO1	Understand the Basic of Electrical network elements
			CO2	Understand the behavior of semiconductor switches and its applications
			CO3	Apply Time & frequency domain analysis of first & second order networks
			CO4	Understand the Applications of Analog & Digital circuits
28	20ME2105	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.
29	20ME2101	MECHANICS OF SOLIDS	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
30	20ME2106	FLUID MECHANICS & HYDRAULIC MACHINES	CO1	Understand physical laws related to fluid statics and buoyancy
			CO2	Apply continuity, Euler and Bernoulli 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 to verify and apply various fluid flow principles and performance evaluation of various hydraulic machines like turbines and pumps
31	20ME2107	MANUFACTURING TECHNIQUES	CO1	Understand and apply the casting processes
			CO2	Apply the welding processes and identify the faults in welding processes
			CO3	Apply principles of cold/hot forming processes
			CO4	Apply sheet metal processes and design sheet metal dies.
			CO5	Fabricate the parts using machine tools
32	20ME2208	MECHANICAL ENGINEERING DESIGN	CO1	Selection of appropriate materials in mechanical design
			CO2	Emphasize the fundamentals of mechanical behavior of materials
			CO3	Design of machine components for static strength
			CO4	Design of machine components for fatigue strength
			CO5	To perform static and dynamic analysis in various structures and to solve complex engineering problems
33	20ME2210	ANALYSIS OF THERMAL SYSTEMS	CO1	Understand phase equilibrium of a pure substance, Determine efficiency of Rankine vapor power cycle
			CO2	Estimate dimensional parameters of various steam nozzles including convergent and divergent nozzles and efficiency of condensers
			CO3	Understand the fundamentals of internal combustion engines
			CO4	Compare various methods of refrigeration by understanding working principles, Understand principle of psychrometry and air-conditioning process
			CO5	Analyze internal & external fluid flows and Analyze steady and transient heat transfer through various systems

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34	20ME2211	ANALYSIS OF MECHANISMS AND MACHINES	CO1	Identify, select and analyze kinematically suitable mechanisms for required motion of machinery
			CO2	Develop velocity and acceleration diagrams and analyze the data
			CO3	Develop cam profiles and Analyze gears and gear trains kinematically
			CO4	Analyze mechanisms dynamically
			CO5	Apply the theoretical concepts to design mechanisms by using the simulation software and analyzing the data.
35	20ME2212	ENGINEERING IN THE PHYSICAL WORLD	CO1	Recalling the Laws and fundamentals related to thermal energy and electrical energy
			CO2	Applying the laws in thermal and electrical systems.
			CO3	Analyzing and designing of thermal systems.
			CO4	Analyzing real time energy systems and developing a novel design.
			CO5	Modeling and Numerical analysis of thermal systems
36	20ME3113	MACHINE DESIGN & INNOVATION	CO1	Model the machine elements such as bearings, bolts, belts and gears
CO2			Analyze the machine elements to design a new component	
CO3			Characterize the mechanical system to a real world application	
CO4			Synthesize the modal to design a mechanical system	
33			CO5	Design and execute a fully functional prototype, Utilize models and engineering analysis for design, Manage a design project from concept to prototype, Validate design requirements, Complete reliability analyses and risk assessments
37	20ME3114	INDUSTRY 4.0 & DESIGN OF CYBER PHYSICAL SYSTEMS	CO1	Apply the basic principles of AI in solutions that require problem solving
			CO2	Understand the concepts of Robotics and its control
			CO3	Understand the concepts of IoT and its applications
			CO4	Understand the concepts of Cloud Technology
			CO5	Apply the concepts of Cyber security and Control Systems
38	20ME3115	HEAT TRANSFER	CO1	Apply Fourier law of conduction and combined conduction convection concepts to 1-D heat transfer problems.
			CO2	Analyze heat transfer using extended surfaces , unsteady state heat transfer and 2-D conduction mode of heat transfer
			CO3	Understand convection mode of heat transfer and heat transfer during phase change by applying the empirical correlations to solve convection problems
			CO4	Apply the principles of heat transfer to analyze and design different heat exchangers.
			CO5	Experimental verification of various heat transfer parameters
39	20ME3216	ARTIFICIAL INTELLIGENCE AND DATA ANALYTICS	CO1	Understand about Artificial Intelligence, techniques of AI and Problem solving by Search, Heuristic Search, Randomized search techniques and Finding Optimal paths
			CO2	Analyze the appropriate methodologies for problem decompositions, planning and constraint data constraint satisfactions.
			CO3	Understand the Basics of Descriptive Statistics, Inferential Statistics.
			CO4	Understand the Basics of Regression & ANOVA and Prescriptive analytics.
			CO5	Apply the theoretical concepts to conduct various experiments on Search Techniques and Language Representation.
			CO1	Understand the basic concepts of Java Language.
			CO2	Understand the basic concepts of Loop Controls and Decision Making through Java Language.

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40	20ME3221	OOPS THROUGH JAVA	CO3	Understand the basic concepts of Class and Object in Object Oriented Programming through Java Language.
			CO4	Understand the basic concepts of Inheritance in Object Oriented Programming through Java Language.
			CO5	Apply the concepts of ObjectOriented Programming through Java Language.
41	20ME3222	R-PROGRAMMING	CO1	Understand the Basic Concepts of R Language Syntax.
			CO2	Understand the Basic Concepts of Objects, Symbols and Environments in R Language.
			CO3	Understand the Basic Concepts of Functions in R Language
			CO4	Understand the Basic Concepts of Object-Oriented Programming in R Language.
			CO5	Apply the concepts of R Programming, for Statistical Software Development.
42	20ME3223	PYTHON PROGRAMMING	CO1	Understand the Basic Concepts of Python.
			CO2	Understand the Basic Concepts of Reading, Writing and Organizing Files using Python.
			CO3	Understand the Basic Concepts of Working with CSV Files, Excel Spreadsheets, Pdf and Word Documents using Python
			CO4	Understand the Basic Concepts of Scheduling Tasks and Launching Programs using Python.
			CO5	Apply the concepts of Python Programming, for Automating the Industrial needs.
43	20ME3224	MACHINE LEARNING	CO1	Understand the basic Python Programming and basic computations using Python
			CO2	Understand and apply the basic Machine Learning and Pre-processing techniques in Machine Learning
			CO3	Understand and apply supervised Machine Learning techniques-Regression Techniques
			CO4	Understand and apply supervised Machine Learning techniques – Classification Techniques
			CO5	Apply Machine Learning algorithms to solve real world problems
44	20ME4051	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
45	20ME4052	DYNAMICS OF MULTI BODY SYSTEMS	CO1	Analyze one DOF free and forced undamped vibration systems
			CO2	Analyze and control of one DOF forced damped vibration systems
			CO3	Analyze and control of Two and Multi DOF vibration systems
			CO4	Analyze continuous systems and vibration measurement.
46	20ME4053	MODELING ANALYSIS & DESIGN OF ROBOTIC SYSTEMS	CO1	Understand the forward and inverse dynamics and different types of dynamic formulation schemes.
			CO2	Modeling of motion of robots and manipulators
			CO3	Kinematic modeling and analysis of mechanical and robotic systems
			CO4	Understand the control of mechanical / robotic systems
47	20ME4054	CREEP FATIGUE 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
		ADVANCED	CO1	Analyze statically indeterminate beams
			CO2	Analyze stresses in curved beams and Examine the Shear Centre for various cross sections of beams

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48	20ME4055	ADVANCED STRENGTH OF MATERIALS	CO3	Apply unit load method to find deflections in beams and structures
			CO4	Analyze stresses in rotating members and thick cylinders
			CO5	To simulate the structural members using ANSYS and validate the results with analytical methods
49	20ME4056	MECHANICS OF COMPOSITES	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
50	20ME4057	SUSTAINABLE DESIGN & SOCIAL INNOVATION IN ENGINEERING DESIGN	CO1	Able to know all fundamental concepts related to the courses in Engineering Design Specialization
			CO2	Able to gain hands-on experience on all relevant software tools
			CO3	Able to identify the real-world problem and inculcate problem solving and critical thinking skills
			CO4	Design and execute a fully functional prototype
51	20ME4061	MODERN 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.
52	20ME4062	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.
53	20ME4063	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
54	20ME4064	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.
			CO5	Conduct experiments & hands on experience related to NC part programming
55	20ME4065	ROBOTICS & INDUSTRIAL AUTOMATION	CO1	Explain the General function of Industrial Automation
			CO2	Identify Safety in Industrial Automation,
			CO3	Identify and understand the types of Industrial Sensors
			CO4	Identify Practical Programmable Logic Controller Applications
56	20ME4066	REVERSE ENGINEERING AND	CO1	Understand the need of reverse engineering
			CO2	Understand working principles of RP techniques

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56	20ME4006	ENGINEERING AND RAPID PROTOTYPING	CO3	Understand Rapid tooling and RP case studies
			CO4	Understand applications of RP techniques
57	20ME4067	SUSTAINABLE DESIGN & SOCIAL INNOVATION IN SMART MANUFACTURING	CO1	Able to know all fundamental concepts related to the courses in Smart Manufacturing Specialization
			CO2	Able to gain hands-on experience on all relevant software tools
			CO3	Able to identify the real-world problem and inculcate problem solving and critical thinking skills
			CO4	Design and execute a fully functional prototype
58	20ME4071	AUTOMOBILE ENGINEERING	CO1	Understand various principles, components, classification of vehicles in an Automobiles
			CO2	Understand working of Engine cooling system, coolant properties and combustion chambers.
			CO3	Understand various lubricating systems, its properties and Transmission systems of an Automobile
			CO4	Understand the concepts of Suspension system and Vehicle control in an Automobile.
			CO5	Able to apply the various concepts of Automobile engineering using simulation and analysis through suitable soft wares
59	20ME4072	HYBRID & ELECTRIC VEHICLE DESIGN	CO1	Understand the functioning of electric vehicle components and comparison with Internal combustion
			CO2	Determine the Motor Torque Calculations for Electric Vehicle
			CO3	Understand the classification of Electric vehicles and working of various fuel cells
			CO4	Understand the importance and working of motors in Electric drive.
60	20ME4073	AUTOTRONICS & SAFETY	CO1	Understand various principles, characteristics, testing, maintenance, and servicing of batteries.
			CO2	Understand working of ignition system of an S I engine, its maintenance and service.
			CO3	Understand wiring for Auto electrical systems for I C Engines
			CO4	Understand the concepts of safety for various domains in automobiles
			CO5	Apply the various concepts of Automobile engineering using electronics through suitable soft wares.
61	20ME4074	ROBOTICS & INDUSTRIAL AUTOMATION	CO1	Explain the General function of Industrial Automation
			CO2	Identify Safety in Industrial Automation,
			CO3	Identify and understand the types of Industrial Sensors
			CO4	Identify Practical Programmable Logic Controller Applications
62	20ME4075	AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEM	CO1	Understanding battery, Cranking motor construction and testing methods
			CO2	Understand the principle of alternator and to test the alternator.
			CO3	Understand the Electronic Controls in Gasoline Engine.
			CO4	Understand the basics of Vehicle Motion Control and telematics system
			CO5	Perform OBD II test on vehicle and Program MYRIO hardware using Lab view.
63	20ME4076	AUTOMOBILE ENGINE SYSTEM AND PERFORMANCE	CO1	Apply the knowledge of basic engine technology along with principle. Summaries of Engine Cycles.
			CO2	Apply the concept performance aspect of mixture preparation and ignition system for SI and CI Engines and Combustion in Engines.
			CO3	Pollutant Formation, Emission control methods and Emission norms
			CO4	Engine Testing, Performance analysis and Emerging Engine Technologies
			CO5	Experiments on I C Engines for performance calculation

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64	20ME4077	SUSTAINABLE DESIGN & SOCIAL INNOVATION IN AUTOMOBILE ENGINEERING	CO1	Able to know all fundamental concepts related to the courses in Automobile Engineering Specialization
			CO2	Able to gain hands-on experience on all relevant software tools
			CO3	Able to identify the real-world problem and inculcate problem solving and critical thinking skills
			CO4	Design and execute a fully functional prototype
65	20ME4081	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
66	20ME4082	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
			CO5	Practically study the various Sensors used in automobiles
67	20ME4083	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
			CO5	Experiments on computerized Diesel Engine and Lab view based Engine control unit
68	20ME4084	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	Solve 2-D problems in rectangular Components
			CO4	Analyze suitable instrument for a given application
69	20ME4085	AUTOTRONICS AND VEHICLE INTELLIGENCE	CO1	Acquire comprehensive knowledge on Automotive Electric and Electronic Systems with diagnosis and service
			CO2	Understand the technologies embedded in Automotive systems with applications
			CO3	Comprehend about Vehicle Intelligence and the applications in modern vehicles
			CO4	Explore and conjecture the emerging technologies in Autonomous Vehicles with future aspects
			CO5	Practical Implementation of electronics embedded in automotive technology using NI LABVIEW software
70	20ME4086	AUTONOMOUS VEHICLE DESIGN	CO1	Understand the rationale for and evolution of automotive electronics and understand which automotive systems have been replaced by electronic control systems
			CO2	Understand the fundamental theory of operation of electronic control systems and basics of how automotive ECUs function in conjunction with the vehicle data bus networks and sensors
			CO3	Become familiar with the various types of advanced driver assistance systems and Understand the concept of cyber-physical control systems and their application to collision avoidance and autonomous vehicles.
			CO4	Understand the concept of remote sensing and the types of sensor technology needed to implement remote sensing and Understand the basic concepts of wireless communications and wireless data networks.

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71	20ME4087	SUSTAINABLE DESIGN & SOCIAL INNOVATION IN AUTOTRONICS	CO1	Able to know all fundamental concepts related to the courses in Autotronics Specialization
			CO2	Able to gain hands-on experience on all relevant software tools
			CO3	Able to identify the real-world problem and inculcate problem solving and critical thinking skills
			CO4	Design and execute a fully functional prototype
72	20ME4091	DESIGN FOR QUALITY AND RELIABILITY	CO1	Model repairable and non-repairable systems and calculate failure rate, repair rate, reliability and availability
			CO2	Use various probability density distributions significant to reliability calculations
			CO3	Fit a given failure data set of a product into a Weibull distribution and estimate the reliability parameters.
			CO4	Preventive maintenance failure modes and effects
73	20ME4092	DESIGN OF AGRICULTURAL PRODUCTS AND MACHINERY	CO1	Design and selection of machinery elements required for Agricultural machinery
			CO2	Measurement of force, stress, torque, speed, displacement and acceleration on machine elements
			CO3	Study of Design considerations on Farm Machinery
			CO4	Study of Design considerations on Tractors and Power tillers
74	20ME4093	DESIGNING INTELLIGENCE SYSTEMS	CO1	Principles of complex and living systems
			CO2	Concepts such as Information intensity & Knowledge
			CO3	Introduction to emerging digital technologies
			CO4	Apply these ideas in design
75	20ME4094	SUSTAINABLE DESIGN	CO1	To equip the design student with specific environmentally-responsive tools, principles
			CO2	To understand the methodologies in preparation for professional application. Management
			CO3	To use a variety of techniques to communicate effectively
			CO4	To understand the life-cycle assessment methods
76	20ME4095	SYSTEMS THINKING FOR DESIGN	CO1	The importance of modeling systems to realize effective designs
			CO2	Abstraction of key elements from problem situations
			CO3	Use of specific techniques to model problems in a holistic manner
			CO4	Use of specific techniques for self-regulating systems
77	20ME4096	DESIGN WITH ADVANCED ENGINEERING MATERIALS	CO1	Understanding selection of materials for various engineering application
			CO2	Understanding the need of high temperature materials (super-alloys)
			CO3	Understanding the need of engineering plastics, elastomers
			CO4	Understanding the need of ceramics, and coatings
78	20ME4097	SUSTAINABLE DESIGN & SOCIAL INNOVATION IN PRODUCT DESIGN	CO1	Able to know all fundamental concepts related to the courses in Product Design Specialization
			CO2	Able to gain hands-on experience on all relevant software tools
			CO3	Able to identify the real-world problem and inculcate problem solving and critical thinking skills
			CO4	Design and execute a fully functional prototype
79	19ME40B4	ROBOTICS	CO1	Analyze the anatomy of existing robotic systems and their performance specifications, end effectors etc
			CO2	Analyze a robotic system with respect to the suitable sensors, actuators for its performance.
			CO3	Understand manipulator kinematic analysis and joint trajectory plan for a given end effector.
			CO4	Classification of Robot Languages, Comprehensive identification of suitable Robotic system for various applications.
			CO1	Identify appropriate sensor, Identify appropriate actuation system for a given application.

S No	Course Code	Course Title	CO NO	Description of the Course Outcome
80	19ME40B5	MECHATRONICS	CO2	Identify appropriate microcontroller for a given application and to build a mathematical Model of system for evaluating open loop system performance and behaviour.
			CO3	Identify an appropriate closed loop control strategy to attain the desired system behaviour.
			CO4	Suggest a Mechatronic product design for a given application and evaluate its performance.
81	19ME40B6	OPERATIONS RESEARCH	CO1	Model and Solve for the optimum solutions using LPP
			CO2	Model and Find the Optimized solutions for the problems in the field of Transportation and Management / Assignments.
			CO3	Model and Optimize Game theory, Dynamic Part Programming, Queuing Theory , Inventory Control & Simulation Problems
			CO4	Understand and solve the Concepts related to PERT/CPM
82	19ME40B7	HYBRID ELECTRIC VEHICLES	CO1	Understand the functioning of electric vehicle components and comparison with Internal combustion
			CO2	Determine the Motor Torque Calculations for Electric Vehicle
			CO3	Understand the classification of Electric vehicles and working of various fuel cells
			CO4	Understand the importance and working of motors in Electric drive.
83	19ME40B8	INDUSTRY 4.0	CO1	Understand the drivers and enablers of Industry 4.0.
			CO2	Appreciate the smartness in Smart Factories, Smart cities, smart products and smart services
			CO3	Able to outline the various systems used in a manufacturing plant and their role in an Industry 4.0 world
			CO4	Appreciate the power of Cloud Computing in a networked economy
84	19ME40B9	INDUSTRIAL AUTOMATION	CO1	Explain the General function of Industrial Automation
			CO2	Identify Safety in Industrial Automation,
			CO3	Identify and understand the types of Industrial Sensors
			CO4	Identify Practical Programmable Logic Controller Applications
85	19ME40C1	LOGISTICS & SUPPLY CHAIN MANAGEMENT	CO1	Understand the primary differences between logistics and supply chain management
			CO2	Know the basic concepts of SCM and list out the important drivers of SC.
			CO3	Understand the importance of SC drivers and their influence on SC performance
			CO4	Able to apply the concepts of SCM on simple real time SC's
86	19ME40C2	TOTAL QUALITY MANAGEMENT	CO1	Learn the principles and practices of TQM.
			CO2	Know the evolution and challenges made in industries by TQM.
			CO3	Understand the models to solve the problems and improving the circumstances.
			CO4	Learn the quality tools implemented in industries and its performances.
87	19ME40C3	SMART MOBILITY	CO1	Able to appreciate the advantages of ITS
			CO2	Able to suggest the appropriate technologies for field conditions.
			CO3	Able to suggest the appropriate system/s in various functional areas of transportation
			CO4	Able to amalgamate the various systems, plan and implement the applications of ITS
88	19ME40C4	MANAGERIAL 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

S No	Course Code	Course Title	CO NO	Description of the Course Outcome
		ENGINEERS	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