	KLEF			
	DEPARTMENT OF MECHANICAL ENGINEERING			
	2017-2021 BATCH Course Outcomes (COs)			
S No	**Course Code**	**Course Title**	**CO NO**	**Description of the Course Outcome**
1	17EN1201	BUILDING BLOCKS FOR COMMUNICATION SKILLS	CO1	Improve pronunciation skills and understand the method of identifying antonyms.
			CO2	Apply writing strategies for office/ formal communication
			CO3	Analyze types of reading techniques and improve reading speed.
			CO4	Analyze different cultures and the importance of empathy in cross-cultural communication.
2	17EN3102	INSTANT COMMUNICATION SKILLS	CO1	Analyse the concept of Group Discussion and speak effectively during the discussion.
			CO2	Apply and analyze various concepts of writing strategies in professional communication skills like, reports, proposals and minutes of the meeting.
			CO3	Analyse vocabulary and apply the types of reasoning in comprehending the information.
			CO4	Apply the mechanics and application of presentation skills and apply people skills in various social organizational and corporate ambiences.
3		APTITUDE BUILDER –I	CO1	Apply the concept of Critical Reading and Analytical Reading and comprehend the key ideas and gist of a passage. Understand the importance of the presentation skills, analyze the given topic, apply various strategies and the principles of grammar in written expression.
			CO2	Apply the concepts of grammar, various strategies and the usage of formal language in written expression. By using synonyms rewrite the same text in the same format and meaning. Write the gist of the given text.
			CO3	Apply the concepts of Numbers to solve the problems related to divisibility rules, problems based on Unit's digit, Remainders, Successive Division, Prime Factorization, LCM & HCF problems. Apply the concepts of Averages &Alligations, students will be able to solve the problems related to Averages as well as problems based on Mixtures.
			CO4	Apply the various concepts of cubes to find out how to cut a cube to get the maximum number of smaller identical pieces, how to minimize the number of cuts required to cut a cube into the given number of smaller identical pieces, how to count the number of smaller cubes which satisfy the given painting scheme. Apply the principles of binary logic to solve problems involving truth-tellers, liars and alternators. Analyze the given data to form an ordered arrangement from an unorganized raw data.
4		APTITUDE BUILDER –II	CO1	Apply the strategies and techniques learnt in carrying out conversations in different contexts. Analyse the different parameters and formats of written technical communication and apply in everyday work and life.
			CO2	Analyse the concepts of critical and analytical reading skills. Apply the strategies and techniques learnt in handling interviews in different contexts.
			CO3	Apply the concepts of Ratio & Proportion, Percentages, Profit &Loss, Simple & Compound Interest, students will be able to solve the problems based on Ratios, problems involving Percentages, problems related to cost price, selling price, profit, loss, marked price and discounts, problems involving interest.
			CO4	Analyze the given series of numbers to predict the next number in the series. Analyze the given set of numbers or letters to find the analogy. Analyze the given data to find the code which is used to encode a given word and use the same code in the process of decoding. Apply the given set of conditions to select a team from a group of members.

5	17MB4057	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	
6	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.	
7	17UC0010	UNIVERSAL HUMAN VALUES AND 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.	
8	17AC1001	INDIAN HERITAGE AND CULTURE	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	
			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	
9	17AC1002	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	
10	17AC1003	ENVIRONMENT AND SUSTAINABILITY	CO1	Able to think critically about the environmental, societal, and economic impacts of human activities and systems	
			CO2	Familiar with emissions quantification methods and sustainability reporting tools, including certification programs for individuals and businesses	
			CO3	Understand about various Cross-Disciplinary Considerations	
			CO4	Learn various strategies for service organizations to decrease their environmental footprint and to market those activities to meet the demands of an emerging consumer base.	
11	17AC1004	GENDER SENSITIZATION	CO1	Students will have developed a better understanding of important issues related to gender in contemporary India	
			CO2	Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film	
			CO3	Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.	
			CO4	Students will acquire insight into the gendered division of labour and its relation to politics and economics.	
			CO1	Model the physical laws and relations mathematically as a first order differential equations, solve by analytical and numerical methods also interpret the solution.	

12	17MT1101	SINGLE VARIABLE MATRIX ALGEBRA	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.
13	17 MT 1102	FOUNDATIONS OF COMPUTATIONAL MATHEMATICS	CO1	Evaluate mathematical expressions by using different types of operations on numbers.
			CO2	Simplify expressions and solve equations & inequations.
			CO3	Apply different types of arithmetic expressions to solve given problems.
			CO4	Apply methods to find areas, volumes and use graphs to reduce non-linear to linear forms.
14	17MT1203	MULTIVARIATE CALCULUS	CO1	Determine extreme values for functions of several variables
			CO2	Determine area, volume moment of inertia through multiple integrals in Cartesian or polar co ordinates.
			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
15	17MT1204	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.
16	17MT2102	Theory of Differential Equations in Engineering and Mechanics	CO1	Obtain the response of a mechanical system having single degree-of-freedom for free and forced vibrations through linear differential equations.
			CO2	Model and solve free and forced vibrations of a two- degree-of-freedom system through system of linear differential equations.
			CO3	Obtain canonical forms of linear second order PDEs and Demonstrate the nature of the incompressible fluid flow using Euler and Bernoulli equations.
			CO4	Identify the heat and wave equations in different forms, obtain their responses and develop empirical relations.
			CO5	Determine the response of mechanical vibrating systems and heat equations which are modelled by ordinary or partial differential equations using MATLAB.
17	17PH1001	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.

18	17CY1001	ENGINEERING CHEMISTRY	CO1	Predict potential complications from combining various chemicals or metals in an engineering setting
			CO2	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena
			CO3	Examine water quality and select appropriate purification technique for intended problem
			CO4	Apply polymers, conducting polymers ,green chemistry and nano chemistry to engineering processes
			CO5	An ability to analyze & generate experimental skills
19	17CS1101	PROBLEM SOLVING AND COMPUTER PROGRAMMING	CO1	Illustrate how problems are solved using computers and programming.
			CO2	Illustrate and use Control Flow Statements in C.
			CO3	Interpret & Illustrate user defined C functions and different operations on list of data.
			CO4	Implement Linear Data Structures and compare them.
			CO5	Apply the knowledge obtained by the course to solve real world problems.
20	17GN1204	Coding Skills for Engineers	CO1	Apply the concepts of basic programming to solve the basic problems, pattern based problems
			CO2	Build solutions for problems on Numbers and array based problems , functions, recursion
			CO3	Solve problems solutions for character/string based problems and pointers
			CO4	Build solutions to programs on Data structures concepts.
21	17ME1001	ENGINEERING MECHANICS	CO1	Understand the concept of forces and apply the static equilibrium equations.
			CO2	Analyze co-planar and non co-planar system of forces.
			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 and analyze the engineering systems with the help of mechanics concept to solve the engineering problems.
22	17ME1002	ENGINEERING GRAPHICS AND DESIGN	CO1	Understand the principles of drawing and use of drafting instruments
			CO2	Draw engineering curves and scales.
			CO3	Draw the projections of points, lines, planes and solids
			CO4	Draw the surface sheath of solids by development of surfaces and the sections of Solids.
			CO5	Prepare 2D & 3D drawings of solids and their transformations.

23	17ME1003	WORKSHOP PRACTICE	CO1	Prepare the different joints using carpentary trade by using wood as raw material
			CO2	Prepare the different fits using fitting trade with Ms plates as raw material
			CO3	Prepare the different components using Tinsmithy trade by using GI sheet as raw material
			CO4	Apply basic electrical engineering knowledge for house wiring practice.
			CO5	Install operating system in CPU and Assemble & Disassemble the CPU
24	17ME1104	INTRODUCTION TO MECHANICAL ENGINEERING	CO1	Possess basic understanding and knowledge about the scope, current and future trends in mechanical engineering
			CO2	Understand concept of Engineering design and stages in product design cycle
25	17GN1001	BASIC ENGINEERING MEASUREMENTS	CO1	Understand the Basic fundamentals of a measurement system.
			CO2	Understand various Mechanical measuring parameters, and apply different measuring techniques on various mechanical parameters using simulation and experimentation tools.
			CO3	Understand various Electrical measuring parameters, and apply different measuring techniques on various Electrical parameters using simulation and experimentation tools.
			CO4	Understand various Electronic measuring parameters, and apply different measuring techniques on various Electronic parameters using simulation and experimentation tools.
			CO5	Apply the theoretical concepts to measure different parameters.
26	17EE2205	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
27	17ME2206	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
			CO5	Ability to select bench marks to confirm the computational approach
28	17ME2005	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.
			CO1	Draw different line types and various dimensioning, conventional representation of materials and machine components, sectioning, limits, fits and tolerances.

				CO2	Draft various types of screws, bolts and nuts, bolted joints, locking arrangements and also draft various types of couplings and their arrangements and model the same using Solid works
29	17ME2107	Machine Drawing		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.
30	17ME2109	Mechanics and Materiasl-I		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
31	17ME2108	Thermal-Fluids Engineering-I		CO1	Understand and apply the fundamental principles and definitions of thermodynamics, fluid mechanics, and heat transfer.
				CO2	Apply the laws of thermodynamics for thermal systems associated with heat transfer and work transfer, entropy generation and its influence on engineering systems.
				CO3	Elucidate the basic properties, principles and applications of fluids, fluid components, fluid statics and different types of fluid flows.
				CO4	Describe fluid boundary layers, turbulence and their implementation in flow of fluid in engineering systems.
				CO5	Apply the theoretical concepts to conduct various experiments of thermodynamics, fluid mechanics practically.
32	17ME2110	Dynamics and Control-I		CO1	Understand the need and significance of vibration analysis in mechanical systems
				CO2	Analyze the mathematical model of a linear vibratory system to determine its response
				CO3	Apply the linear mathematical models for real world engineering systems
				CO4	Analyze Lagrange's equations for linear and nonlinear vibratory systems
				CO5	Determine vibratory responses of SDOF and MDOF systems to harmonic, periodic and non-periodic excitation
33	17ME2211	Dynamics and Control-II		CO1	Acquire the ability to use the appropriate elements and interconnection laws to obtain a mathematical model of a dynamic system generally consisting of ordinary differential equations
				CO2	Acquire the ability to linearize nonlinear systems and arrange the equations that make up the model in a form suitable for solution, and use them to construct and simplify block diagrams.
				CO3	Able to determine the transfer function and system response and its poles and zeros, analyze stability etc.,
				CO4	Understand different control techniques to achieve the system stability.
				CO5	Apply Matlab knowledge to Obtain the response of a system to arbitrary inputs. Study the influence of changing system parameters on the system response, and predict the response. Create root-locus plots, bode diagrams, etc. as aids in analyzing and designing feedback systems
34	17ME2212	Thermal-Fluids Engineering-II		CO1	Apply the principles of thermodynamics, heat transfer, and fluid mechanics to the design and analysis of engineering systems.
				CO2	Elucidate the thermodynamics and fluid mechanics steady flow components of thermodynamic plant as well Laminar and turbulent flow of fluids in channels and over surfaces.
				CO3	Identify thermodynamic state of a pure substance and determine the thermodynamic properties and explain the design approach to thermodynamic plants.

			CO4	Analyze Rankine, power cyles and explain refrigeration and air conditioning systems.
			CO5	Apply analytical cognitive skills of the theoretical concepts to conduct various experiments of thermodynamics and fluid mechanics practically.
35	17ME2213	MECHANICS AND MATERIALS - II	CO1	Apply materials in mechanical design based on mechanical behavior of engineering materials.
			CO2	Emphasize the fundamentals of mechanical behavior of materials
			CO3	Determine the mechanical properties of materials to design.
			CO4	Select the material for mechanical application.
			CO5	Determine the properties of materials experimentally
36	17ME3114	DESIGN AND MANUFACTURING – I	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
37	17ME3115	ENGINEERING MANAGEMENT	CO1	Illustrate the primary concepts about management, its principles and functions and the types of business organizations and Demonstrate the knowledge to solve complex engineering problems in industrial scenario.
			CO2	Analyze the concepts of financial management includes present worth and future worth of invested money through cash flow diagram and differed annuities.
			CO3	Acquire knowledge in economic analysis and cost accountancy.
			CO4	Demonstrate the principles of business innovation and entrepreneurship for establishing industrial ventures
38	17ME3116	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. Understand the fundamentals of radiation and estimate the radiation heat exchange between two bodies.
			CO5	Experimental verification of various heat transfer parameters
39	17ME3117	FINITE ELEMENT ANALYSIS OF SOLIDS AND FLUIDS	CO1	Understand the general procedure of Finite Element Method and apply the knowledge of stresses & strains for general case of loading in solving simple engineering problems
			CO2	Apply FEM to solve the Solid Mechanics problems
			CO3	Apply FEM to solve the Heat Transfer problems
			CO4	Apply FEM to solve the Fluid Mechanics problems
			CO5	Analyze beams, bars, Fluid flow using ANSYS software
40	17ME3118	INTRODUCTION TO	CO1	Understand the Basic fundamentals of a robot system, mechanisms, dynamics and control
			CO2	Understand various Planar and spatial kinematic equations, differential motion, energy method for robot mechanics; mechanism design for manipulation and locomotion; multi-rigid-body dynamics; force and compliance control, balancing control of a robot.

40	17ME3118	ROBOTICS	CO3	Understand various visual feedback, human-machine interface; actuators, sensors, wireless networking, and embedded software in designing a robot.
			CO4	Understand and apply various real-time control schemes, vehicle navigation, arm and end-effector design, and balance concepts.
			CO5	Apply the theoretical concepts to develop a capstone project.
41	17ME3219	DESIGN AND MANUFACTURING – II	CO1	Understand and analyze the working of various machining processes.
			CO2	Implement NC and CNC programing for machining simple components
			CO3	Apply the automation of production lines.
			CO4	Design of various manufacturing processes.
			CO5	Implement modern manufacturing techniques
42	17ME3220	ELEMENTS OF MECHANICAL DESIGN	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
			CO5	Fabricate the design subject to engineering Constraints
43	17TS701	SKILLING FOR ENGINEERS-1 (MANUFACTURING TECHNOLOGIES)	CO1	Preparation of sand moulds with proper gating and riser system
			CO2	Machining using machine tools and preparation of CNC part program.
			CO3	Preparation of work piece for various welding operations and performing welding using different welding equipment
			CO4	Production of parts using rapid prototyping
			CO5	Hands on experience for performing experiments in Casting, Machining, Welding and Rapid prototyping
44	17TS702	SKILLING FOR ENGINEERS-2 (ARTIFICIAL INTELLIGENCE)	CO1	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 Knowledge Representation using Predicate Logic, Representing Knowledge using Rules, Semantic Nets, Frames and Conceptual dependencies.
			CO4	Apply the theoretical concepts to conduct various experiments on Search Techniques and Language Representation using AI
45	17TS703	SKILLING FOR ENGINEERS-3 (PROBLEM SOLVING TECHNIQUES IN THERMAL)	CO1	Analyze fluid flow through pipes or channels (internal flow)
			CO2	Analyze fluid flow over different geometrical objects (external flow)
			CO3	Analyze steady and transient heat transfer through various systems
			CO4	Analyze fluid flow and heat transfer from various systems
46	17TS704	SKILLING FOR ENGINEERS-4 (PROBLEM SOLVING TECHNIQUES IN DESIGN)	CO1	Understand the stages and importance of engineering design process
			CO2	Design and modelling of various mechanical assemblies
			CO3	Analyze the different problems solving techniques of mechanical components
			CO4	Identifying and solving the real complex engineering problems
			CO1	Gather enough relevant data, conduct data analytics using scientific methods, and make appropriate and powerful connections between quantitative analysis and real-world problems.

47	17TS705	TECHNICAL PROFICIENCY & TRAINING-1 (DATA ANALYTICS)	CO2	Demonstrate a sophisticated understanding of the concepts and methods; know the exact scopes and possible limitations of each method; and show capability of using data analytics skills to provide constructive guidance in decision making.
			CO3	Use advanced techniques to conduct thorough and insightful analysis and interpret the results correctly with detailed and useful information.
			CO4	Show substantial understanding of the real problems; conduct deep data analytics using correct methods; and draw reasonable conclusions with sufficient explanation and elaboration. Make better decisions by using advanced techniques in data analytics
48	17TS706	TECHNICAL PROFICIENCY & TRAINING-2 (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
49	17GN2109	Cocurricular Activity -1	CO1	Communicate effectively in the gathering.
			CO2	Demonstrate their interpersonal and communication skills.
			CO3	Understand and work effectively as an individual in a Team.
			CO4	Improve their creativity in developing useful models.
50	17GN2210	Cocurricular Activity -2	CO1	Communicate effectively in the gathering.
			CO2	Demonstrate their interpersonal and communication skills.
			CO3	Understand and work effectively as an individual in a Team.
			CO4	Improve their creativity in developing useful models.
51	17GN3111	Cocurricular Activity -3	CO1	Communicate effectively in the gathering.
			CO2	Demonstrate their interpersonal and communication skills.
			CO3	Understand and work effectively as an individual in a Team.
			CO4	Improve their creativity in developing useful models.
52	17GN3212	Cocurricular Activity -4	CO1	Communicate effectively in the gathering.
			CO2	Demonstrate their interpersonal and communication skills.
			CO3	Understand and work effectively as an individual in a Team.
			CO4	Improve their creativity in developing useful models.
53	17ME4051	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
			CO4	Design and analysis of different types of gear drives
			CO5	Analyze machine elements using analysis software
54	17ME4052	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

55	17ME4053	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.	
56	17ME4054	COMPUTER AIDED DESIGN	CO1	Understand the Fundamentals of CAD and display devices	
			CO2	Apply the concept of geometric modelling	
			CO3	Able to apply concept of Surface and solid modelling	
			CO4	Application of various Geometric transformations	
57	17ME4055	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	
58	17ME4056	ADVANCED STRENGTH OF MATERIALS	CO1	Analyze statically indeterminate beams	
			CO2	Analyze stresses in curved beams and Examine the Shear Centre for various cross sections of beams	
			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	
59	17ME4057	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	
60	17ME4061	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.	
			CO5	Apply the modern manufacturing techniques	
61	17ME4062	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	
		ADDITIVE	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.	

62	17ME4063	ADDITIVE MANUFACTURING	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.	
63	17ME4064	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.	
			CO5	Gain practice on designing the tools and dies using a software package.	
64	17ME4065	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	
65	17ME4066	GEOMETRIC DIMENSIONING AND TOLERANCING	CO1	Understand the Application of Dimensioning	
			CO2	Understand the application of Tolerances.	
			CO3	Read and interpret the industrial drawings.	
			CO4	Development of a Dimensional Inspection Plan	
66	17ME4067	REVERSE ENGINEERING AND RAPID PROTOTYPING	CO1	Understand the need of reverse engineering	
			CO2	Understand working principles of RP techniques	
			CO3	Understand Rapid tooling and RP case studies	
			CO4	Understand applications of RP techniques	
67	17ME4071	AUTOMOBILE ENGINEERING	CO1	Understand various principles, components, classification of 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 software	
68	17ME4072	AUTOMOBILE ENGINE DESIGN	CO1	Understand the basic knowledge on automobile engine nomenclatures and its performance parameters involved in developing an engine	
			CO2	Apply knowledge to explore different types of design models and factors involved in modeling an engine component in details with real time application.	
			CO3	Comprehend different functional aspects for good performance of an engine and factors causing failure of an engine	
			CO4	Understand different types of maintenance activities involved and study of faultfinding equipment in detail.	
			CO5	Modeling and analysis of engine components of an automobile using CAD software tools- Laboratory	
			CO1	Understand the importance of construction and working of a clutch in automobile industry and troubleshooting of clutch	

69	17ME4073	AUTOMOTIVE TRANSMISSION	CO2	Understand the importance of construction and working of gear box and total resistance to motions
			CO3	Understand different mechanisms used while adopting a torque converter and various Automotive Transmission mechanisms
			CO4	Understand working principle of drive line system components
			CO5	Apply contemporary issues and their impact on provided solution in addition to that students will be able to solve open-ended problem related to design the transmission components using CAD
70	17ME4074	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 software
71	17ME4075	ALTERNATIVE ENERGY SOURCES FOR AUTOMOBILES	CO1	Acquire comprehensive knowledge on Electric Vehicles and Hybridization of automobiles with applications.
			CO2	Understand the technology of Hydrogen driven vehicles and fuel properties along with application in engine performance.
			CO3	Comprehend about Solar powered automobiles and estimate the performance of engines driven by alternative liquid fuels (Biofuels) and gaseous fuels (Natural Gas and Propane vehicles).
			CO4	Explore and conjecture the emerging technologies and future source of alternative fuels in automobiles.
			CO5	Practically study the various technologies of alternative energy sources applied in the advanced scenario of automobile engineering.
72	17ME4076	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.
73	17ME4077	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
74	17ME4081	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
75	17ME4082	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
76	17ME4083	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
77	17ME4084	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
78	17ME4085	AUTOTRONICS AND VEHICLE INTELLIGENCE	CO1	Analyze various electronics systems like sensors
			CO2	Understand Fuel injection and Ignition system
			CO3	Understand Electric vehicles and hybrid vehicles
			CO4	Design of intelligence vehicle systems
79	17ME4086	AUTOMOTIVE SYSTEMS	CO1	Understand the importance of automotive systems
			CO2	Understand the Two-wheel drive, four-wheel drive vehicles
			CO3	Analyze the transmission system
			CO4	Analyze control system for Automotive systems
80	17ME4087	PROGRAMMABLE LOGIC CONTROLLERS	CO1	Understand the importance of Factory Automation
			CO2	Understand the functions and operations of PLC
			CO3	Understand the Installation and maintenance procedures for PLC
			CO4	Analyze PLC for the control of industrial processes
81	17ME4091	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
82	17ME4092	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
83	17ME4093	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

84	17ME4094	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
85	17ME4095	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
86	17ME4096	MICROCONTROLLER AND PLC	CO1	Understand the concept of 8051 microcontroller
			CO2	Design the 8051 microcontroller
			CO3	Understand the concept of PLC
			CO4	Write ladder logic in Programmable logic controllers.
87	17ME4097	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
88	17ME4101	PROGRAMMING SKILLS	CO1	Able to know the Basics of Computation, Algorithms, and Functional Programming.
			CO2	Able understand the Iterative style, recursive style, and efficiency issues in programming.
			CO3	Able to understand the Basics of imperative style programming, Assertions, and Loop invariants.
			CO4	Able to understand Top down design, Step-wise refinement, structures, encapsulation, and object-oriented programming.
			CO5	Able to Apply the theoretical concepts of programming to develop and execute the programs.
89	17ME4102	DATA ANALYTICS	CO1	Able to know the Basics of Descriptive Statistics.
			CO2	Able understand the Inferential Statistics.
			CO3	Able to understand the Basics of Regression & ANOVA.
			CO4	Able to understand Prescriptive analytics.
			CO5	Able to Apply the theoretical concepts of data analytics to solve problems.
90	17ME4103	PYTHON	CO1	Able to know the Basics of Programming, and Python.
			CO2	Able understand Lists, Function definition, Sorting, Passing functions.
			CO3	Able to understand Exception handling, Input / output, File handling, String processing, Backtracking, Scope, Data structures.
			CO4	Able to understandClasses, Objects and user defines data types.
			CO5	Able to Apply the theoretical concepts of python to develop and execute the programs.
			CO1	Able to know the Basics of Machine Learning.

91	17ME4104	MACHINE LEARNING	CO2	Able understand Model Validation Approaches, Discriminant Analysis.
			CO3	Able to understand Random Forest, Neural Networks Deep learning.
			CO4	Able to understand Clustering, Associative Rule Mining, and Challenges for big data analytics.
			CO5	Able to Apply the theoretical concepts of Machine Learning to solve problems.
92	17ME4105	ARTIFICIAL INTELLIGENCE	CO1	Introduction to AI, Understand about intelligence, knowledge and Artificial Intelligence, techniques of AI as a State space search, Production Systems.
			CO2	Problem solving by Search, Heuristic Search, Randomized search techniques and Finding Optimal paths
			CO3	Analyze the appropriate methodologies for problem decompositions, planning and constraint data constraint satisfactions.
			CO4	Understand Knowledge Representation using Predicate Logic, Representing Knowledge using Rules, Semantics Nets,Frames and Conceptual dependencies.
93	17ME4106	FUZZY LOGIC AND NEURAL NETWORKS	CO1	Understanding the Concepts of Fuzzy sets, Fuzzy Logic, importance of membership functions, Fuzzy Rule, and operations on fuzzy sets, Principles of Fuzzy Logic System in solving the complex engineering problems
			CO2	Applications of Fuzzy sets for real time problems of various domains using Fuzzy Logic control system
			CO3	Understand Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Back propagation, Associative Learning,
			CO4	Understanding Neuro Fuzzy Approaches, Computing with Neural Nets and Applications of Neural Network in various Domains
94	17ME4107	ROBOTICS	CO1	Understand the concept of robotics with respect to their anatomy, Sensors and Controllers.
			CO2	Understand the image processing techniques in Robot vision
			CO3	Understand the working of Robots in various mechanical applications
			CO4	Understand the various Robot Languages
95	17ME40B4	Mechatronics	CO1	Identify appropriate sensor, Identify appropriate 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 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.