K L UNIVERSITY

DEPARTMENT OF MECHANICAL ENGINEERING

2017-2021 BATCH Course Outcomes vs Program Outcomes

Course Articulation Matrix

S No	Course Code	Course Title	CO NO	Description of the Course Outcome	Program Outcomes											
					1	2	3	4	5	6	7	8	9	10	11	12
1	17MT1101	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.	2											
			CO2	Model physical laws and relations mathematically as second/higher order differential equations, solve by analytical method and interpret the solution.	2											
			CO3	Obtain the Fourier series expansions of periodic functions and use the series to solve ordinary differential equations.	2											
			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.	2											
			CO5	Verify the solution of problems through MATLAB.					2							
2	17 MT 1102	FOUNDATIONS OF COMPUTATIONAL MATHEMATICS	CO1	Evaluate mathematical expressions by using different types of operations on numbers.	2											
			CO2	Simplify expressions and solve equations & inequations.	2											
			CO3	Apply different types of arithmetic expressions to solve given problems.	2											
			CO4	Apply methods to find areas, volumes and use graphs to reduce non-linear to linear forms.	2											
3	17 PH 1001	ENGINEERING MATERIALS	CO1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.	1											
			CO2	Understands magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.	1											
			CO3	Understands thermal and mechanical properties of materials, heat treatment methods for changing the microstructure of materials and responses of materials subjected to load.	1											
			CO4	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.	1											
			CO5	Apply the knowledge on structure and properties of materials while executing experiments and develop inter disciplinary projects.				2								
4	17CS1101	PROBLEM SOLVING AND COMPUTER PROGRAMMING	CO1	Illustrate how problems are solved using computers and programming.	2	2										
			CO2	Illustrate and use Control Flow Statements in C.	2	2										
			CO3	Interpret & Illustrate user defined C functions and different operations on list of data.	2	2										
			CO4	Implement Linear Data Structures and compare them.				2								
			CO5	Apply the knowledge obtained by the course to solve real world problems.	2	2		2								
5	17 ME 1104	INTRODUCTION TO MECHANICAL ENGINEERING	CO1	Possess basic understanding and knowledge about the scope, current and future trends in mechanical engineering	1				1							
			CO2	Understand concept of Engineering design and stages in product design cycle	1				1							
6	17 ME 1001	ENGINEERING MECHANICS	CO1	Understand the concept of forces and apply the static equilibrium equations.	2	2										
			CO2	Analyze co-planar and non co-planar system of forces.	2	2										
			CO3	Apply the concept of centroid & centre of gravity to determine moment of inertia.	2	2										
			CO4	Analyze the rigid bodies under translation and rotation with and without considering forces.		2										
			CO5	Understand and analyze the engineering systems with the help of mechanics concept to solve the engineering problems.				2								

7	17 ME 1003	WORKSHOP PRACTICE	CO1	Prepare the different joints using carpentary trade by using wood as raw material					2								
			CO2	Prepare the different fits using fitting trade with Ms plates as raw material					2								
			CO3	Prepare the different components using Tinsmithy trade by using GI sheet as raw material					2								
			CO4	Apply basic electrical engineering knowledge for house wiring practice.					2								
			CO5	Install operating system in CPU and Assemble & Disassemble the CPU					2								
8	17 EN 1201	BUILDING BLOCKS FOR COMMUNICATION SKILLS	CO1	Improve pronunciation skills and understand the method of identifying antonyms.										1			
			CO2	Apply writing strategies for office/ formal communication										2			
			CO3	Analyze types of reading techniques and improve reading speed.										2			
			CO4	Analyze different cultures and the importance of empathy in cross-cultural communication.								2					
9	17MT1203	MULTIVARIATE CALCULUS	CO1	Determine extreme values for functions of several variables	2												
			CO2	Determine area, volume moment of inertia through multiple integrals in Cartesian or polar co ordinates.	2												
			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	2												
			CO4	Obtain analytical and numerical solutions of Heat and wave equations	2												
			CO5	Verify the solution of problems through MATLAB					2								
10	17 ME 1002	ENGINEERING GRAPHICS	CO1	Understand the principles of drawing and use of drafting instruments	2									2		2	
			CO2	Draw engineering curves and scales.	2									2		2	
			CO3	Draw the projections of points, lines, planes and solids	2									2		2	
			CO4	Draw the surface sheath of solids by development of surfaces and the sections of Solids.	2									2		2	
			CO5	Prepare 2D & 3D drawings of solids and their transformations.	2									2		2	
11	17 CY 1001	ENGINEERING CHEMISTRY	CO1	Predict potential complications from combining various chemicals or metals in an engineering setting			2	2									
			CO2	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena			2	2									
			CO3	Examine water quality and select appropriate purification technique for intended problem			2	2									
			CO4	Apply polymers, conducting polymers ,green chemistry and nano chemistry to engineering processes			2										
			CO5	An ability to analyze & generate experimental skills			2	2									
12	17 GN 1001	BASIC ENGINEERING MEASUREMENTS	CO1	Understand the Basic fundamentals of a measurement system.			1										
			CO2	Understand various Mechanical measuring parameters, and apply different measuring techniques on various mechanical parameters using simulation and experimentation tools.	1			1									
			CO3	Understand various Electrical measuring parameters, and apply different measuring techniques on various Electrical parameters using simulation and experimentation tools.	1			1									
			CO4	Understand various Electronic measuring parameters, and apply different measuring techniques on various Electronic parameters using simulation and experimentation tools.	1			1									
			CO5	Apply the theoretical concepts to measure different parameters.				2									

13	17 CS 1202	DATA STRUCTURES	CO1	Illustrate solving typical problems using Arrays, Strings and Lists.	2	2										
			CO2	Demonstrate applications of stacks & queues and solving typical problems using recursion.	2	2										
			CO3	Demonstrate use of sorting, Heaps and binary tree techniques in problem solving.	2	2										
			CO4	Examine AVL trees and Hashing techniques.				2								
			CO5	Apply the knowledge obtained by the course to solve real world problems.	2	2		2								
14	17 MT 1204	LOGIC AND REASONING	CO1	Apply the fundamental principle of counting and use them to measure the uncertainty in random experiments.	2											
			CO2	Apply Venn diagrams to find the conclusion of statements, solve puzzles using binary logic and problems relating to cubes.	2											
			CO3	Apply the available models for Data sufficiency & redundancy and interpret it , when given, in tabular and graphical forms.	2											
			CO4	Apply the Reasoning techniques to solve problems on arrangements, series, analogies, coding and decoding.	2											
15	17 EN 2102	INSTANT COMMUNICATION SKILLS	CO1	Analyse the concept of Group Discussion and speak effectively during the discussion.										2		
			CO2	Apply and analyze various concepts of writing strategies in professional communication skills like, reports, proposals and minutes of the meeting.										2		
			CO3	Analyse vocabulary and apply the types of reasoning in comprehending the information.										2		
			CO4	Apply the mechanics and application of presentation skills and apply people skills in various social organizational and corporate ambiences.										2		
16	17 ME 2105	METALLURGY	CO1	Understand the significance of cooling curves and phase diagrams.	1											
			CO2	Ability to understand various heat treatment processes.				1								
			CO3	Identify fuels and furnaces used in metallurgical industries and to Understand the mineral processing basic principles.	1											
			CO4	Acquires knowledge on extraction of metals, production of components using powder metallurgy technique.	1											
			CO5	Identify and differentiate various types of materialsand understand various heat treatment method.	1											
17	17 MT 2001	PROBABILITY AND NUMERICAL METHODS	CO1	Apply the conditional probability and discrete distributions to suitable real-world situations.	1											
			CO2	Apply continuous distributions to suitable real- world situations and also analyze bivariate data using correlation and regression analysis.	1											
			CO3	Test for means-single and two sample means	1											
			CO4	Identify different mathematical problems and reformulate them in a way that is appropriate for numerical treatment .	1											
18	17ME2106	THERMODYNAMICS	CO1	Understand the fundamentals of thermodynamic systems and processes.	1											
			CO2	Apply first law of thermodynamics to various flow and non-flow processes.	2	2										
			CO3	Apply second law of thermodynamics and principle of entropy to Engineering Devices.	1											
			CO4	Apply principles of combustion for gravimetric and volumetric analysis of fuels.	2	2										
			CO5	Plan and conduct simple experiments to demonstrate thermodynamic principles.				2								
19	17 ME 2107	STRENGTH OF MATERIALS	CO1	Analyze stresses in members with 1D axial loading or torsion				2								
			CO2	Analyze shear force and bending moment diagrams				2								
			CO3	Analyze deflections and stresses in beams		2										
			CO4	Design columns and pressure vessels		2										
			CO5	Apply the theoretical concepts to conduct various experiments of strength of materials practically and analyze the data				2								
20	17 ME 2108	MANUFACTURING TECHNOLOGY	CO1	Understand and appreciate the breadth and depth of the field of manufacturing technology.		1										
			CO2	Understand various casting procedures and melting practices used for producing different products.		1										
			CO3	Understand various special casting approaches used for producing precision components.		1										
			CO4	Understand various welding methods for joining metals and alloys.		1										
			CO5	Gain hands on experience in converting a given raw material into desired shape and size by applying suitable casting and welding processes.				2								

21	17 ME 2109	FLUID MECHANICS & HYDRAULIC MACHINES	CO1	Understand physical laws related to fluid statics and buoyancy.	1	1										
			CO2	Apply continuity, Euler's and Bernoulli's equations in various fluid flow situations.	2	2										
			CO3	Understand and apply momentum equation and boundary layer concepts to flow through pipes and to impact of jets.	2	2										
			CO4	Apply fluid dynamical principles to hydraulic machines.	2	2										
			CO5	Conduct experiments on various hydraulic machines like turbines and pumps				2								
22	17 ME 2210	KINEMATICS OF MACHINES	CO1	Identify various possible 4 link mechanisms and their inversions and applicability	1	1										
			CO2	Analyze mechanisms kinematically using velocity and acceleration diagrams	2	2										
			CO3	Analyze cam profiles and the motion of their followers	2	2										
			CO4	Analyze gears and gear trains kinematically	2	2										
			CO5	Apply the theoretical concepts to conduct various experiments to Analyze Mechanism , gear trains and draw Cam Profile.				2								
23	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.	1											
			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.	1											
			CO3	Apply Laplace transform techniques to solve differential equations	1											
			CO4	Compute Fourier transforms using integrals and solve differential equations	1											
24	17 ME 2211	METAL CUTTING AND METAL FORMING	CO1	Understand the theoretical background of metal cutting.		1										
			CO2	Understand and estimate the economics of machining various processes.		1										
			CO3	Understand the theory of metal forming in shaping of components.		1										
			CO4	Understand and estimate the loads in various metal forming processes.		1										
25	17 ME 2212	VAPOUR POWER SYSTEMS	CO1	Understand the properties of pure substance and evaluate the Rankine cycle efficiency for regenerative and binary vapor power cycles.	1		1									
			CO2	Understand the working principles of steam generators and steam nozzles.		2		2								
			CO3	Evaluate the performance of steam turbines and condensers.		2		2								
			CO4	Understand the principles of refrigeration and psychrometry.	1	1										
			CO5	Experimental verification of various vapour power devices.				2								
26	17 ME 2213	MACHINE DRAWING	CO1	Understand different types of fasteners and draft various types of joints, locking arrangements.	2				2							
			CO2	Understand and draft various types of couplings and their arrangements and model the same using Solid works	2				2							
			CO3	Prepare the assembly drawing of engine parts, machine Components both in conventional form and then by using software.	2				2							
			CO4	Generate detail drawings of individual parts of an assembled machine Component both in conventional form and then by using software.	2				2							
27	17 EE 2202	BASICS OF ELECTRICAL & ELECTRONICS ENGINEERING	CO1	Understand basics of DC circuit analysis, fundamentals of AC and introduction three phase circuits	1											
			CO2	Understand construction & working principle of DC Machines	1											
			CO3	Understand construction & working principle of Transformer, three phase and single phase induction motor.	1											
			CO4	Understand number systems and their conversions, characteristics of PN junction diode	1											
			CO5	Conduct an experiment to analyze the performance of various electrical and electronic devices and draw their char characteristics.	2											
28	17 EN 3203	CORPORATE COMMUNICATION SKILLS	CO1	Analyse the method of identifying synonyms and antonyms and analyze the meaning of a word from the context.										2		
			CO2	Analyze various strategies involved in writing an essay and apply various styles in writing.										2		
			CO3	Analyse the organization of the passage and also analyze the tone, attitude and style of the author.										2		
			CO4	Acquire knowledge on various employability skills & analyze a situation and develop adaptability.					2							

29	17 ME 3114	GAS POWER SYSTEMS	CO1	Understand thermodynamic relations to ideal and real gas problems.	2	2										
			CO2	Understand the working principles of reciprocating air compressors and evaluate their performance.	2	2										
			CO3	Understand the working principle of rotary compressors and evaluate their performance.	2	2										
			CO4	Understand the operating principles of gas turbine and jet propulsion and evaluate their performance.	2	2										
			CO5	Conduct experiments on reciprocating and rotary machines.				2								
30	17 ME 3115	DYNAMICS OF MACHINES	CO1	Analyze the static and dynamic forces of planar mechanisms and flywheels	2	2										
			CO2	Analyze the static and dynamic balancing of rotating as well as reciprocating masses due to unbalanced forces	2	2										
			CO3	Understand the free and forced vibrations of single degree freedom systems	2	2										
			CO4	Analyzethe gyroscope and governor mechanisms for controlling the moving vehicles	2	2										
			CO5	Apply the theoretical concepts to mechanisms by using the simulation software and analyzing the data				2	2							
31	17 ME 3116	MACHINE TOOLS AND METROLOGY	CO1	Understand the working of standard machine tools such as lathe, milling, drilling, grinding, and allied machines.		1										
			CO2	Understand and principles and design considerations of jigs and fixtures used in various machining operations.		1										
			CO3	Understand the procedures to measure the geometrical details of various mechanical elements and assemblies using linear and angular measuring instruments.		1										
			CO4	Understand the procedures to measure the surface roughness and roundness of given mechanical components.		1										
			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.				2								
32	17 ME 3117	INTERNAL COMBUSTION ENGINES	CO1	Analyze various air standard cycles and their performance	2	2										
			CO2	Understand the working principles of 2-stroke and 4-stroke engines, SI and CI Engines.	1											
			CO3	Understand fuel supply system and combustion phenomenon in SI and CI Engines.	1											
			CO4	Analyze and evaluate performance of SI and CI Engines.		2		2								
			CO5	Conduct experiments on SI and CI Engines, analyze and interpret the experimental data and observations.				2								
33	17 ME 3118	OPERATIONS RESEARCH	CO1	Identify Optimum solutions for various single objective problems using Linear Programming models.		1									1	
			CO2	Identify Optimum Solutions through Transportation and Assignment models		1									1	
			CO3	Identify Optimum Solutions through Game theory, DPP, Queuing theory & Simulation models		1									1	
			CO4	Solve project management problems using CPM, PERT and Crashing		2									2	
			CO5	Solve Various Linear Programming, Transportation, Assignment, Game Theory and Simulation models through POM Software					2						2	
34	17 ME 3219	ROBOTICS	CO1	Understand the concept of robotics with respect to their anatomy, classification end effectors.	1											
			CO2	Analyze a suitable sensors for robotic system design with respect to their applications.			2									
			CO3	Ability to solve the kinematics for robot manipulator			2									
35	17 ME 3220	HEAT TRANSFER	CO1	Understand laws of heat transfer and apply Fourier law of conduction for one dimensional heat conduction to engineering problems.	2	2										
			CO2	Analyze steady state conduction problems involving internal heat generation and extended surfaces and one dimensional unsteady state heat conduction problems.	2	2										
			CO3	Apply principles of convection, boiling and condensation and evaluate convective heat transfer coefficient for different flow situations.	2	2		`								
			CO4	Design of heat exchangers; Understand principles of radiation and evaluate radiative heat transfer between two bodies.	2	2										
			CO5	Conduct experiments and demonstrate heat transfer phenomena involving conduction, convection and radiation.				2								

36	17 ME 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	2												
			CO2	Design the appropriate fastening technique			3										
			CO3	Design the power transmission elements such as keys, shafts and couplings			3										
			CO4	Design the appropriate springs such as helical or leaft springs			3										
			CO5	Analyze machine elements using ANSYS software				2	2								
37	17 ME 3222	COMPUTER INTEGRATED MANUFACTURING	CO1	Understand the basic fundamentals of computer aided design and manufacturing.		1											
			CO2	Explain the basic concepts of NC and CNC programming in machining.		1											
			CO3	Learn the basic concepts of group technology and flexible manufacturing systems.		1											
			CO4	Learn the basic concepts of computer aided process planning.		1											
			CO5	Gain hands on experience in converting a given raw material into desired shape and size by applying suitable casting and welding processes.				2									
38	17 ME 3223	PRODUCTION AND OPERATION MANAGEMENT	CO1	Apply various work-study techniques to determine the standard time and efficiency.		2									2		
			CO2	Analyze various quality control techniques for bringing out the best quality output.		2									2		
			CO3	Apply various production scheduling techniques to optimize productivity & Forecast the future demand for the product		2									2		
			CO4	Apply various strategies to optimize the Inventory cost		2									2		
			CO5	Validate the theoretical concepts by doing the experiments in the laboratory				2							2		
39	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											2		
			CO2	Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions											2		
			CO3	Compute the depreciation of an asset using standard depreciation techniques to assess its impact on present or future value											2		
			CO4	Apply all mathematical approach models covered in solving engineering economics problems											2		
40	17 ME 4124	MECHATRONICS	CO1	Understand the role of sensors and transducers for control systems	2												
			CO2	Apply the concepts of control systems in the field of automation.				2									
			CO3	Acquire ability to analyze and simulate response of a control systems				2									
			CO4	Apply the principles of PLCs in the design of control systems to achieve desired performance characteristics			2										
			CO5	Modelling of different systems with the help of control systems concepts and controllers to solve the engineering problems.		2											
41	17 ME 4125	DESIGN OF TRANSMISSION ELEMENTS	CO1	Design and selection of various belt and chain drives			3										
			CO2	Design and Selection of the suitable bearing for the given loading condition			3										
			CO3	Analyze kinematic and dynamic aspects in design of brakes, clutches and IC engine components			3										
			CO4	Design and analysis of different types of gear drives			3										
			CO5	Analyze machine elements using analysis software					2								
42	17GN1001	ECOLOGY AND ENVIRONMENT	CO1	Understand the importance of Environmental education and conservation of natural resources.						1							
			CO2	Understand the importance of ecosystems and biodiversity.													1
			CO3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process.						2							
43	17GN1002	HUMAN VALUES	CO1	Understand and identify the basic aspiration of human beings								1					
			CO2	Envisage the roadmap to fulfill the basic aspiration of human beings.								2					
			CO3	Analyze the profession and his role in this existence.								2					

44	17 ME 4051	ADVANCED STRENGTH OF MATERIALS	CO1	Analyze Statically Indeterminate Beams	2	2										
			CO2	Analyze Curved Beams and Beams subjected to Unsymmetrical bending	2	2										
			CO3	Apply Energy methods to find deflections in simple Structures	2	2										
			CO4	Analyze Stresses in Rotating members and Thick cylinders	2	2										
45	17 ME 4052	FINITE ELEMENT METHOD	CO1	Analyze 3D stresses & strains for general loading and solving complex engineering problems using approximate methods	2	2										
			CO2	Analyze 1D structural problems using FEM	2	2			2							
			CO3	Analyze 2D problems including axi-symmetric solids subjected to axi-symmetric loading using FEM	2	2			2							
			CO4	Analyze thermal problems structural dynamic problems using FEM	2	2			2							
46	17 ME 4053	ADVANCED VIBRATIONS AND NOISE CONTROL	CO1	Understand the concepts of acoustics and vibrations	2	2										
			CO2	Determine the sources of vibrations	2	2										
			CO3	Measure the level of vibration and control the vibrations	2	2										
			CO4	Measure and control the noise observed from vehicles.	2	2										
47	17 ME 4054	COMPUTER AIDED DESIGN	CO1	Understand the Fundamentals of CAD and display devices	1				1							
			CO2	Apply the concept of geometric modeling	2				2							
			CO3	Able to apply concept of Surface and solid modeling	2				2							
			CO4	Application of various Geometric transformations	2				2							
48	17 ME 4055	CONDITION MONITORING	CO1	Understand the types of Maintenance Techniques	1											
			CO2	Diagnose fault through Vibration Monitoring	2											
			CO3	Interpret the Faults through Thermal Monitoring or Lubricant Analysis	2											
			CO4	Apply sensors for condition monitoring	2											
49	17 ME 4056	CREEP FATIQUE AND FRACTURE MECHANICS	CO1	Assess the failure of unflawed structural components		2		2								
			CO2	Assess the fatigue life of structural components under the specified load spectrum		2		2								
			CO3	Evaluate the fracture toughness and assess the life of flawed structural components		2		2								
			CO4	Assess the life of structural components under creep		2		2								
50	17 ME 4057	THEORY OF ELASTICITY AND PLASTICITY	CO1	Analyze stresses and strains in planes in elastic or plastic region	2	2										
			CO2	Solve 2-D problems in rectangular Components	2	2										
			CO3	Analyze stresses and strains in 3-D problems	2	2										
			CO4	Analyze Beams and frames in plasticity applications	2	2										
51	17 ME 4058	MECHANICS OF COMPOSITE MATERIALS	CO1	Know the composite materials and manufacturing methods	1											
			CO2	Understand the behaviour of composite Lamina	1											
			CO3	Know the properties of various types composite materials	1											
			CO4	Apply Failure theories to calculate stresses in composite materials	2											
52	17 ME 4061	MODREN MANUFACTURING PROCESSES	CO1	To classify and understand the need of Non-Traditional Manufacturing Processes.		1										
			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.		1										
			CO3	To understand the working principle and the effect of various process parameters on its performance of various Non-Traditional Welding Processes.		1										
			CO4	To understand the working principle of various Non-Traditional Forming Processes.		1										

53	17 ME 4062	ADVANCED MATERIALS	CO1	Ability to identify different types of optimization problems		1										
			CO2	Understand basic concepts in solving nonlinear optimization problems		1										
			CO3	Understand optimality conditions for unconstrained and constrained optimization problems and be able to apply them in verifying the optimality of a solution		1										
			CO4	Understand basics of choosing and implementing optimization methods		1										
54	17 ME 4063	ADDITIVE MANUFACTURING	CO1	To be able to properly distinguish between the hype and realities of additive manufacturing		1										
			CO2	To understand the basic AM processes, and the limitations and advantages of each.		1										
			CO3	To understand the differences between traditional processes and additive manufacturing production, including the differences in design methodology.		1										
			CO4	To use AM terminology properly and understand the role and importance of standards in the additive manufacturing industry.		1										
55	17 ME 4064	AUTOMATION IN MANUFACTURING	CO1	Understand the strategies and components of automation in productions.			1									
			CO2	Analyze the automated flow lines in production systems.			1									
			CO3	Analyze and design the assembly lines and materials handling systems of production systems.			1									
			CO4	Develop the adoptive system for a machine cell.			1									
56	17 ME 4065	TOOL ENGINEERING AND DESIGN	CO1	Develop the ability to design cutting tools for given single component.		1										
			CO2	Design and development of various die configurations.		1										
			CO3	Design and development of jigs for given component.		1										
			CO4	Design and development of fixtures for given component.		1										
57	17 ME 4066	FLEXIBLE MANUFACTURING SYSTEMS	CO1	Analyze various production schedules and plant layouts.		1										
			CO2	Apply the concept of group technology to the development of FMS.		1										
			CO3	Identify hardware and software components of FMS.		1										
			CO4	Analyze materials handling and storage system in FMS.		1										
58	17 ME 4067	SMART MATERIALS	CO1	Understand the behavior and applicability of Piezoelectric materials in designing smart structures and materials.			1									
			CO2	Understand the behavior and applicability of Shape memory alloys in designing smart structures and materials.				1								
				Understand the behavior and applicability of Electro active polymers in designing smart structures and materials.			1									
			CO3	Understand the behavior and applicability of Magnetostrictive materials in designing smart structures and materials.			1									
59	17 ME 4068	MACHINE TOOL DESIGN	CO1	Understand basic motions involved in a machine tool.			1									
			CO2	Design machine tool structures.				1								
			CO3	Design and analyze systems for specified speeds and feeds.			1									
			CO4	Select subsystems for achieving high accuracy in machining.			1									
60	17 ME 4071	REFRIGERATION & AIR-CONDITIONING	CO1	Analyze COP of different refrigeration cycles with different methods of refrigeration using different refrigerants.	2	2										
			CO2	Analyze the performance of Vapor Compression Refrigeration with modification of cycle and its components.	2	2										
			CO3	Understanding the working of Cascade systems for low temperature Production and of VAR system.	1											
			CO4	Analyze cooling load for comfort and industrial air conditioning on basis of processes on psychometric charts and its components.	2	2										

61	17 ME 4072	NON-CONVENTIONAL ENERGY SOURCES	CO1	Understand and analyze various solar thermal applications.	2	2										
			CO2	Analyze the performance of tidal, wave and Ocean thermal energy conversion (OTEC) systems		2		2								
			CO3	Understand and analyze the operation of wind, geothermal, biomass and bio-gas power generation.	2	2										
			CO4	Understand and analyze the operation of solar photovoltaic cells fuel cells and the phenomenon of fusion.	2	2										
62	17ME 4073	POWER PLANT ENGINEERING	CO1	Understand the working of system and subsystems of Hydro Electric and Diesel power plants.	2	2										
			CO2	Understand the working of system and subsystems of Thermal and nuclear power plants and to draw their layout diagrams	1	1										
			CO3	Calculate the various factors of power plant economics and understand power generation through Non-conventional energy sources.	2	2										
			CO4	Understand various direct energy conversion systems, pollution and methods to control pollution.	1											
63	17 ME 4074	AUTOMOBILE ENGINEERING	CO1	Understand different types of chassis, engine components, fuel systems and its working principles	1	1										
			CO2	Understand different components of transmission system, cooling and lubrication systems	1	1										
			CO3	Understand different components of suspension, steering and braking systems	1	1										
			CO4	Understand different electric and electronic systems used in automobiles and pollution control techniques used in SI and CI engines.	1	1										
64	17 ME 4075	ADVANCED THERMODYNAMICS	CO1	Understanding the concepts of exergy, thermodynamic potential and calculation of exergy of a system	1											
			CO2	Understanding kinetic theory of gases and intermolecular forces		1										
			CO3	Understanding various methods of statistical distribution of particles	1											
			CO4	Ability to construct figures for particle allocations depending on various probability disrtibutions		2										
65	17ME 4076	RENEWABLE ENERGY TECHNOLOGY	CO1	Understand different types of Renewable Energy Sources and Analyzing the energy production.	2	2										
			CO2	Understand the principles of OTEC and wind energy and analyze wind speed effects in power generation.	2	2										
			CO3	Understand different conversion techniques of biomass to useful fuel or energy.	2	2										
			CO4	Understand different conversion techniques of Geo-Thermal energy.	2	2										
66	17ME 4077	COMPRESSIBLE FLUID FLOW	CO1	To understand and apply compressible flow theory in various propulsion devices.	1											
			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.	2	2										
			CO3	To acquire knowledge on the measuring devices and techniques being used in compressible flows.	1											
			CO4	To understand various aspects of the wave phenomena including the normal and oblique shock waves.	1											
67	17ME 4078	HEAT PIPE: THEORY, DESIGN& APPLICATIONS	CO1	Understand the working principle and operational characteristics of heat pipes	1	1										
			CO2	Understand and interpret the heat pipe operating limits while modeling heat pipes for practical applications	2	2										
			CO3	Understand design and manufacturing considerations of heat pipes for a given industrial application	2	2										
			CO4	Develop Designs for different applications including thermal management of electronic devices, space applications, power plant heat exchangers and HVAC equipment	3	3										

68	17 ME 4081	AUTOMOTIVE SENSOR AND APPLICATIONS	CO1	Learn the sensor classification and sensor product selection guide.	1												
			CO2	Analyze the measurement of engine parameter using sensor.				2									
			CO3	Apply required sensors and actuators for automotive applications			2										
			CO4	Analyze the sensors for intelligent transport systems			2										
69	17 ME 4082	AUTOTRONICS	CO1	Understand the automotive electronics for engine management system	1												
			CO2	Analyze required sensors and actuators for an automotive application				2									
			CO3	Apply the suitability of a control system for automotive application			2										
			CO4	Ability to analyze of electronic system for automotive applications		2											
70	17 ME 4083	ELECTRONIC ENGINE MANAGEMENT SYSTEM	CO1	Understand the automotive instruments and automotive sensors	1												
			CO2	Learn the measurement of engine parameter by using sensor.				1									
			CO3	Acquire ability to analyze the electronic fuel injection system				2									
			CO4	Apply the principles of digital control techniques and the application of on board diagnosis			2										
71	17 ME 4084	INSTRUMENTATION IN AUTOMOTIVE INDUSTRIES	CO1	Understand the knowledge of various Measuring Instruments to design a simple Instrumentation system	1												
			CO2	Analyze the various instruments and use them in various fields				2									
			CO3	Learn and apply the measuring instruments in various industries application			2										
			CO4	Analyze suitable instrument for a given application			2										
72	17 ME 4085	MECHATRONICS SYSTEM DESIGN	CO1	Understand the approach used for mechatronic system design and relevant considerations	1												
			CO2	Applythe suitable sensors and actuators used in a Mechatronic system			2										
			CO3	Analyze signal conditioning interface in a Mechatronic system and implementation of control systems				2									
			CO4	Modeling and Simulation for the Mechatronic System design perspective			2										
73	17 ME 4091	ARTIFICIAL INTELLIGENCE FOR ROBOTICS	CO1	Understand the concepts of AI	1												
			CO2	Apply basic principles of AI in solutions that require problem solving and planning.				2									
			CO3	Apply basic principles of AI in solutions that require problem solving, planning, reasoning and learning				2									
			CO4	Analyze AI in Robotics			2										
74	17 ME 4092	AUTOMATION SYSTEM DESIGN	CO1	Understand the design principles of automation and its application in an automated manufacturing system	1												
			CO2	Analyze pneumatic sub-systems of an automated manufacturing system in terms of design, operation and control aspects				2									
			CO3	Analyze hydraulic sub-systems of an automated manufacturing system in terms of design, operation and control aspects				2									
			CO4	Understand programmable automation with regard to the computer integrated manufacturing system		2											
75	17 ME 4093	INDUSTRIAL AUTOMATION AND CONTROL	CO1	Understand the concepts industrial automation and measurement systems	1												
			CO2	Apply the controllers in automation			2										
			CO3	Analyze and select a suitable PLC system for the given application				2									
			CO4	Apply the concepts of control systems for industrial automation			2										
76	17 ME 4094	INDUSTRIAL HYDRAULIC AND PNEUMATIC SYSTEMS	CO1	Learn the concepts hydraulic or pneumatic actuation system	1												
			CO2	Analyze diagnose maintenance problems of hydraulic and pneumatic system				2									
			CO3	Analyze required components to develop an automation system using pneumatics and hydraulic system			2										
			CO4	Develop circuits for controlling hydraulic and pneumatic using PLC		2											

77	17 ME 4095	INDUSTRIAL ROBOTICS AND MATERIAL HANDLING SYSTEMS	CO1	Understand the concepts of robot,sensors and their applications in robots	1											
			CO2	Learn material handling equipment used both in automated and non-automated systems	1											
			CO3	Analyze and select a suitable material handling system for the given application				2								
			CO4	Apply the various applications of robots in material handling			2									
78	17ME 40A1	AIRCRAFT SYSTEMS DESIGN	CO1	Understand the Design process of Aircraft	1											
			CO2	Determine the forces in Aircraft structures	2	2										
			CO3	Select the aircraft materials for manufacturing processes	2											
			CO4	Analyze stresses in Aircraft structures	2	2										
79	17 ME 40A2	PRODUCT DESIGN AND DEVELOPMENT	CO1	Understand the principles of creativity in Design	1											
			CO2	Analyze Economics in Design	2											
			CO3	Apply Modelling techniques for a product	2											
			CO4	Determine the cost of product and know the significance to product design	2											
80	17 ME 40A3	BIOMECHANICS OF TISSUES AND JOINTS	CO1	Understand the concepts of Biomechanics	1											
			CO2	Apply biomechanics to analyse Tissues and structural systems	2											
			CO3	Analyze joints using Biomechanics theory	2											
			CO4	Apply kinematic mechanisms to human motion	2											
81	17 ME 40A4	MECHATRONICS	CO1	Identify appropriate sensors and actuation system for a given application.			1									
			CO2	Identify appropriate microcontroller for a given application and to build a mathematical Model of system for evaluating open loop system performance and behavior.		1										
			CO3	Suggest an appropriate closed loop control strategy to attain the desired system behavior.		2										
			CO4	Suggest a Mechatronic product design for a given application and evaluate its performance.									2			
82	17 ME 40A5	ROBOTICS	CO1	Understand the concept of robotics with respect to their anatomy, classification end effectors.	1											
			CO2	Analyze a suitable sensor for robotic system design with respect to their applications.		2										
			CO3	Analyze control system for robot control			2									
			CO4	Ability to select the robot configuration for robot applications				2								
83	17 ME 40A6	CONDITION MONITORING	CO1	Understand the types of Maintenance Techniques	1											
			CO2	Diagnose fault through Vibration Monitoring	2											
			CO3	Interpret the Faults through Thermal Monitoring or Lubricant Analysis	2											
			CO4	Apply sensors for condition monitoring	2											
84	17 ME 5001	ADVANCED HEAT & MASS TRANSFER	CO1	Understand 1-D steady state conduction heat transfer	1	1										
			CO2	Apply principles of Heat Transfer to develop Mathematical model for ducts and plates	2	2										
			CO3	Analyze free and forced convection problems	2	2										
			CO4	Apply concepts of radiation heat transfer for enclosure analysis	1	1										
85	17 ME 5003	INCOMPRESSIBLE AND COMPRESSIBLE FLOWS	CO1	Understand the fundamental concepts of continuum mechanics and shock wave theory	1											
			CO2	Apply techniques for analyzing inviscid incompressible flow problem		2										
			CO3	Apply techniques for analysis of laminar and turbulent boundary layer flows		2										
			CO4	Apply techniques for analysis of unsteady compressible flows.		2										

86	17 ME 5002	COMPUTATIONAL FLUID DYNAMICS	CO1	Understand Fundamentals of CFD and Derive the governing equations	2	2											
			CO2	Apply different CFD techniques to diffusion	2	2											
			CO3	Application of time integration methods for convection diffusion	2	2											
			CO4	Solving N-S equations and Modeling of turbulence	2	2											
87	17 ME 5004	MECHANISMS DESIGN AND SIMULATION	CO1	Understand Kinematic principles and Structures	1	1											
			CO2	Analyze mechanisms in linkages Robotic manipulator	2	2											
			CO3	Draw Inflection circle for coupler curves	1	1											
			CO4	Synthesize curve based mechanism and Cam mechanisms	2	2											
88	17 ME 5005	ADVANCED MECHANICS OF SOLIDS	CO1	Analyze Stress, strain in a deformable bodies	2	2											
			CO2	Apply Energy Methods to calculate deflections in members	1	1											
			CO3	Analyze Stresses, deflections in Straight and Curved beams	2	2											
			CO4	Determine contact stresses and deflection of bodies in contact	1	1											
89	17 ME 3126	INDUSTRIAL ENGINEERING TECHNIQUES	CO1	Apply various work-study techniques to determine the standard time and efficiency.		2											
			CO2	Analyze various quality control techniques for bringing out the best quality output.		2											
			CO3	Apply various production scheduling techniques to optimize productivity & Forecast the future demand for the product		2											
			CO4	Apply various strategies to optimize the Inventory cost		2											
90	17 ME 3118	OPERATIONS RESEARCH	CO1	Identify Optimum solutions for various single objective problems using Linear Programming models		2											
			CO2	Identify Optimum Solutions through Transportation and Assignment models		2											
			CO3	Identify Optimum Solutions through Game theory, DPP, Queuing theory & Simulation models		2											
			CO4	Solve project management problems using CPM, PERT and Crashing		2											
91	17 ME 3127	ENGINEERING MANAGEMENT	CO1	Apply various management concepts to solve real life problems		2											
			CO2	Analyze various Economic Evaluation of alternatives and Depreciation methods		2											
			CO3	Analyze various quality control techniques for bringing out the best quality output.		2											
			CO4	Apply various strategies to optimize the Inventory cost		2											
92	17 ME 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.		2											
			CO2	Analyze the existing methods of working for a particular job and develop an improved method through questioning technique by using various recording techniques		2											
			CO3	Apply ergonomic principles in the workplace or other environment		2											
			CO4	Apply various plant layout and production systems to optimize productivity.		2											
93	17 ME 3129	OPERATIONS MANAGEMENT	CO1	Calculate future demand for the product in the market by applying appropriate forecasting technique.		2											
			CO2	Apply various plant layout and production scheduling techniques to optimize productivity.		2											
			CO3	Apply various production scheduling techniques to improve productivity.		2											
			CO4	Analyze various quality control techniques for bringing out the best quality output.		2											
Total					318	301	78	107	47	3	0	7	2	29	25	11	