



Koneru Lakshmaiah Education Foundation

(Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

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Department of Mechanical Engineering


Program: B.Tech-ME

Academic Year:2022-23

S.No	Course Code	Course Title	Co No.	Course Outcome Description
1	22UC1101	INTEGRATED PROFESSIONAL ENGLISH	CO1	Understand the concepts of Grammar 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	22UC1202	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	22UC2103	ESSENTIAL SKILLS FOR EMPLOYABILITY	CO1	Developing basic grammar
			CO2	Discovering and practicing functional grammar
			CO3	Developing Intrapersonal skills.
			CO4	Developing Speaking and Writing Skills
4	22UC2204	CORPORATE READINESS SKILLS	CO1	Extend word power for developing effective speaking and writing skills
			CO2	Differentiate critical and general reading skills
			CO3	Interpret interpersonal skills
			CO4	Demonstrate necessary skills to be employable

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5	22UC0010	UNIVERSAL HUMAN VALUES & PROFESSIONAL ETHICS	CO1	Realize the basic aspiration and understanding harmony in the human being. Understand the process of Self-exploration and able to differentiate between right and wrong. Realize the harmony in the self, and body.
			CO2	Realize the purpose of family and understand about relationship and attain harmony in society
			CO3	Realize ways to attain harmony in nature. Realize the root cause of the techno-genic maladies and able to identify the solution and understand harmony in the human being.
			CO4	Realize the definitiveness of human conduct. Analyze the profession and his role in this existence
6	22UC0007	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
7	22UC0008	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	22UC0009	ECOLOGY AND ENVIRONMENT	CO1	Understand about basic concepts of Environment and Environmental Education
			CO2	Understanding the importance of ecosystems and biodiversity.
			CO3	Understanding the environmental pollution.
			CO4	Understanding the solid waste management, disaster management and EIA process.
			CO1	Students will have developed a better understanding of important issues related to gender in contemporary India


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9	22UC0011	GENDER SENSITIZATION	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.
10	22MT1101	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)
11	22MT2102	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.
12	22ME2209	NUMERICAL COMPUTATION FOR MECHANICAL ENGINEERS	CO1	Apply various approximate methods to solve problems in structural mechanics and to provide simplicity involved in Finite Element Method
			CO2	Apply Galerkin method for solving problems on heat transfer, torsion, and fluid flow
			CO3	Analyze dynamic problems for longitudinal and transverse vibration of beam, and critical load estimation of columns
			CO4	Analyze the experimental data using simple and useful methods of Statistics
			CO5	Apply MATLAB programming to solve solid and fluid mechanics


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				problems
13	22UC1103	DESIGN THINKING AND INNOVATION	CO1	Understand the importance of Design thinking process for contextualized problems
			CO2	Analyse, define, and ideate for solutions
			CO3	Develop and test the prototype made
			CO4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity
14	22PH1010	MECHANICS	CO1	Apply the concept of forces, governing static equations and analyse planar system of forces.
			CO2	Use analytical techniques for analysing forces in statically determinate structures.
			CO3	Apply the concepts of planar and non-planar system of parallel forces and estimate the moment of inertia for lamina and material bodies.
			CO4	Apply fundamental concepts of kinematics and kinetics of particles to solve simple practical problems.
15	22CY1001	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	Explain the role of chemical kinetics in the formation and destruction of ozone in the atmosphere and predict the connection between molecular behavior and observable physical properties.
			CO5	An ability to analyze and generate experimental skills
16	22UC3105	PROBLEM SOLVING SKILLS - 1	CO 1	Apply the concepts of mathematical principles besides logic and identifying certain basic mathematical formulae to solve these kinds of problems
			CO 2	Formulate the concepts of mathematical principles of equations that contain the data related to real life situations which requires basic logic to analyze
			CO 3	Solve concepts of Venn diagrams and number patterns and illustrate logic behind connectives, series, and analogies respectively
			CO 4	Differentiate assumptions and arguments in critical reasoning

17	22UC3206	PROBLEM SOLVING SKILLS - II	CO1	Implement problem solving ability through analyzing the given data and formulate solutions for real world problems based on time, travel, and wages
			CO2	Determine the fundamental concepts of areas, volumes and derive solutions using simple mathematical principles besides interpreting the data through smart tricks to check the number analytics
			CO3	Estimate inductive reasoning, to categorize the rules-set from a given list of observations and relate them to predict the conclusions according to the given conditions
			CO4	Integrate verbal and non-verbal reasoning and to identify the logic behind the given arrangement based on the given conditions to bring out the possible outcome
18	22SC1101	COMPUTATIONAL THINKING FOR STRUCTURED 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.
19	22ME1103	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.
20	22SC1209	DESIGN TOOLS WORKSHOP- II	CO1	Practice the design ideology by 3D printing, 3D scanning techniques
			CO2	Visualize the design ideology by incorporating VR technique and VR technology, Visualize and present his design idea by applying AR technique and Hologram
			CO3	Practice of PCB technology



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			CO4	Practice of Arduino based skill with different interfaces
21	22SC1202	DESIGN OF DATA STRUCTURES	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
			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	22ME1002	ENGINEERING GRAPHICS & 2D MODELLING	CO1	Model Engineering Curves in engineering Practice, Conic sections and special curves, scales both manually and using computer aided design tool (CAD).
			CO2	Project points, lines and planes in first angle third angle both manually and using CAD.
			CO3	Project solids and generate the sectional views of solids, development of surfaces of regular solids both manually and using CAD.
			CO4	Convert orthographic projections to create isometric view and isometric view to orthographic projection both manually and using CAD.
23	22ME2104	3D MODELING AND PHYSICAL PROTOTYPING (WORKSHOP & 3D MODELLING S/W)	CO1	Develop 3D modeling and assembling of machine elements
			CO2	Develop and interpret production drawing for various machine elements
			CO3	Prepare different components using Carpentry, Tin-smithy trade and apply basic electrical engineering knowledge for house wiring practice.
			CO4	Prepare different components using various manufacturing techniques and perform various machining operations.
24	22EE2205	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

25	22ME2105	THERMODYNAMICS	CO1	Examine different thermodynamic terms and distinguish between micro & macroscopic approaches, process & change of state, reversible & irreversible process.
			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	Analyze the performance of different air standard cycles and different psychrometric processes.
26	22PH2007	MATERIALS TECHNOLOGY	CO1	Understand crystallography and various material testing methods
			CO2	Understand and distinguish various types of materials based on their engineering applications
			CO3	Apply the concepts of cooling curves and phase diagrams
			CO4	Analyse various heat treatment processes and their strengthening mechanisms.
			CO5	Gain hands on experience to conduct various experiments of metallography and heat treatment process practically.
27	22ME2106	FLUID MECHANICS & HYDRAULIC MACHINES	CO1	Apply the knowledge of fluid properties and the laws of fluid statics to estimate the total pressure, Centre of pressure and forces on submerged and floating bodies.
			CO2	Apply continuity, Euler and Bernoulli equations and design different flow measuring devices
			CO3	Apply momentum equation and boundary layer concepts to analyze the flow through pipes and impact of jets.
			CO4	Analyze the performance of hydraulic turbines and pumps using velocity triangles and model similitude.
			CO5	Conduct experiments to verify and apply various fluid flow principles and performance evaluation of various hydraulic machines like turbines and pumps
28	22ME2210	ANALYSIS OF THERMAL SYSTEMS (with CFD & Linked to Project))	CO1	Apply the concept of pure substance to analyze the performance of vapor power cycles
			CO2	Analyze the performance of IC engines by applying the concept of air standard cycles
			CO3	Analyze the performance of gas turbine cycles and various jet propulsion systems
			CO4	Analyze the performance of Bell Coleman and Vapour compression refrigeration systems
			CO5	Analyze internal & external fluid flows through a commercial package Ansys - Fluent
			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-

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29	22ME3115	HEAT TRANSFER		D conduction mode of heat transfer
			CO3	Analyze the concepts of convection mode of heat transfer and heat transfer during phase change
			CO4	Apply the principles of heat transfer to analyze and design different heat exchangers.
			CO5	Experimental verification of various heat transfer parameters
30	22ME2101	MECHANICS OF SOLIDS	CO1	Analyze stresses in members with axial loading or torsion
			CO2	Analyze members with multi axial loading and lateral loading.
			CO3	Analyze deflections and stresses in beams
			CO4	Analyse columns and pressure vessels
			CO5	Apply the theoretical concepts to conduct various experiments of strength of materials practically and analyze the data
31	22ME220	MECHANICAL ENGINEERING DESIGN & INNOVATION (Analysis S/W)	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	Analyse the effect of various loads on Mechanical components
			CO6	Design and execute a fully functional prototype
32	22ME2211	KINEMATICS OF MACHINES (With Adams s/w)	CO1	Analyze kinematically suitable mechanisms for required motion of
			CO2	Analyze velocity and acceleration diagrams and interpret the data
			CO3	Construct cam profiles and Analyze gears and gear trains kinematically
			CO4	Analyze gears and gear trains kinematically Analyze mechanisms dynamically
			CO5	Apply the theoretical concepts to analyse different mechanisms by using
33	22ME3118	DYNAMICS OF MACHINES	CO1	Apply analytical / graphical methods for balancing of rotary and reciprocating masses
			CO2	Analyze the forces in linkages and the effect of the Gyroscopic couple in vehicles
			CO3	Analyze the free vibration response of single DOF systems
			CO4	Analyze the forced vibration response of single DOF systems
34	22ME3113	MACHINE DESIGN(Linked to project)	CO1	Design of shafts and couplings
			CO2	Design of fasteners
			CO3	Selection of appropriate bearings and drives
			CO4	Design of gears




			CO5	Design various mechanical systems
35	22ME2107	MANUFACTURING PROCESSES	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 manufacturing processes
36	22ME2212	MANUFACTURING TECHNOLOGY (Linked to Project)	CO1	Understand and analyze metal cutting processes
			CO2	Understand working machine tools and related operations
			CO3	Understand Non-traditional machining processes and automation of production lines
			CO4	Implement CIM concepts and measuring and inspecting of components
			CO5	Implement modern manufacturing techniques
37	22ME3116	OPTIMIZATION TECHNIQUES	CO1	Identify Optimum solutions for various single objective problems using Linear Programming models
			CO2	Identify Optimum Solutions through Transportation and Assignment models
			CO3	Identify Optimum Solutions through Game theory, DPP, Queuing theory & Simulation models
			CO4	Solve project management problems using CPM, PERT and inventory
38	22ME4120	INSTRUMENTATION & CONTROL	CO1	To identify various measurement systems and their purpose in typical instruments
			CO2	Analyze temperatures, flow and different level indicator measurement systems
			CO3	Analyze various instruments to measure stress-strain and Humidity parameters
			CO4	Understand different elements of control systems
			CO5	Study and analyse the different measurement systems
39	22ME3119	ROBOTICS	CO1	Understand the functions of the basic components of a Robot.
			CO2	Applications of drive systems and end effectors
			CO3	Understand the image processing techniques in Robot vision
			CO4	Understand the various Robot Languages
40	22ME3114	INDUSTRY 4.0 & DESIGN OF CYBER PHYSICAL SYSTEMS	CO1	Apply basic principles of Industry 4.0: Cyber Physical Systems in solutions that require problem solving
			CO2	Implement the concepts of Cybersecurity in Industry 4.0 and develop applications
			CO3	Implement the concepts of IoT and develop

				applications
			CO4	Implement the concepts of IIoT and develop applications
			CO5	Apply the concepts of Cyber security and Control Systems to develop real time applications
41	22ME4051	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
42	22ME4052	FINITE ELEMENT METHOD	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.
43	22ME4053	MODELING, ANALYSIS & DESIGN OF ROBOTIC SYSTEMS	CO1	Apply the forward and inverse dynamics for robots
			CO2	Model and simulate of motion of robots and manipulators
			CO3	Kinematic modeling and analysis of mechanical and robotic systems
			CO4	Implementation of the control on mechanical / robotic systems
44	22ME4054	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
45	22ME4055	ADVANCED STRENGTH OF MATERIALS	CO1	Analyze statically indeterminate beams
			CO2	Analyze stresses in curved beams and identify 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
46	22ME4056	MECHANICS OF COMPOSITES MATERIALS	CO1	Know the composite materials and manufacturing methods
			CO2	Identify the behavior of composite Lamina at micro level
			CO3	Identify the behavior of composite Lamina at macro level


			CO4	Apply Failure theories to calculate stresses in composite materials
47	22ME4057	SUSTAINABLE DESIGN & SOCIAL INNOVATION IN ENGINEERING DESIGN	CO1	apply all fundamental concepts related to the streams in Engineering Design Specialization
			CO2	identify the real-world problem and inculcate problem solving and critical thinking skills
			CO3	Develops a conceptual prototype on software tools
			CO4	Design and execute a fully functional prototype
48	22ME4061	MODERN MANUFACTURING PROCESSES	CO1	understand the working principle and the effect of various process parameters of mechanical energy-based machining processes
			CO2	understand the working principle and the effect of various process parameters of chemical and thermoelectric energy-based machining processes
			CO3	understand the working principle and the effect of various process parameters on the performance of various Non-Traditional Welding Processes.
			CO4	understand the working principle of various Non-Traditional Forming Processes.
			CO5	Perform various non traditional manufacturing for product making
49	22ME4062	MACHINE TO MACHINE COMMUNICATION	CO1	Understand the standards, protocols, and algorithms in M2M Communication .
			CO2	Implement the M2M Communication protocols in a prototype.
			CO3	Design new protocols for different scenarios.
			CO4	Understand possible applications of M2M.
50	22ME4063	ADVANCED MATERIALS	CO1	Understand various types of materials involved in manufacturing Composites.
			CO2	Understand the importance of Bio, Smart and microelectronic materials.
			CO3	Understand the significance of functionally graded materials and their applications.
			CO4	Understand synthesis and fabrication methods of nanomaterial and to study characterization techniques.
51	22ME4064	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	Implement NC part programming in part production
			CO1	Identify role of robotics in Industrial Automation

52	22ME4065	ROBOTICS & INDUSTRIAL AUTOMATION	CO2	Identify Safety in Industrial Automation
			CO3	Identify and understand the types of Industrial Sensors
			CO4	Identify Practical Programmable Logic Controller Applications
53	22ME4066	REVERSE ENGINEERING AND RAPID PROTOTYPING	CO1	Understand the principles of Reverse Engineering process and its methodology
			CO2	Understand Rapid prototyping and its classification. Know the various Liquid based RP techniques and their process details, applications.
			CO3	Understand different solid based techniques of Rapid prototyping process and their applications.
			CO4	Understand Powder based RP techniques and their applications and Rapid tooling
			CO5	Apply the theoretical concepts of Reverse Engineering to develop 3D model and analyze
54	22ME4067S	SUSTAINABLE DESIGN & SOCIAL INNOVATION IN SMART MANUFACTURING	CO1	apply all fundamental concepts related to the streams in smart manufacturing Specialization
			CO2	identify the real-world problem and inculcate problem solving and critical thinking skills
			CO3	Develop a conceptual prototype
			CO4	Design and execute a fully functional prototype
55	22ME4071	HYDROGEN AND FUEL CELL TECHNOLOGIES	CO1	Understand various properties of hydrogen and various production methods
			CO2	Understand hydrogen storage methods and employing hydrogen as fuel for IC engine
			CO3	Understand fuel cell basics and Fuel cell thermodynamics
			CO4	Understand fuel cell reaction kinetics
			CO5	Analyze various hydrogen systems and fuel cells using Trnsys and COMSOL Multiphysics
56	22ME4072	SOLAR ENERGY TECHNOLOGIES	CO1	Understand the basics of solar radiation and working principle of various solar collectors
			CO2	Understand the working of solar thermal systems
			CO3	Understand the fundamentals of Solar PV technology
			CO4	Apply the knowledge of thermodynamics and heat transfer to calculate the performance of solar PV systems
			CO5	Analyze various solar thermal and PV systems using TRNSYS software
57	22ME4073	ADVANCED ENERGY STORAGE SYSTEMS	CO1	Understand the basics of Energy storage systems and its applications
			CO2	Modelling of various thermal energy storage systems
			CO3	Understand the construction and working of various electrical storage systems
			CO4	Understand the principles of alternate energy

				storage technologies
			CO5	Analyze various energy storage systems using MATLAB/Simulink
58	22ME4074	ENERGY AUDIT AND MANAGEMENT	CO1	Understand the fundamentals of Energy economics
			CO2	Apply the Engineering principles to estimate the energy conservation in steam generators and compressed air generators
			CO3	Apply the Engineering principles to estimate the energy conservation in rotary equipment, Refrigeration & Air conditioning systems
			CO4	Apply the Engineering principles to estimate the energy conservation in cooling towers and lighting systems
59	22ME4075	COMPUTATIONAL FLUID FLOW AND HEAT TRANSFER – FDM APPROACH	CO1	Understand the basics of PDE and FDM
			CO2	Apply FDM to Steady one- and two-dimensional heat conduction equations
			CO3	Apply FDM to Unsteady one- and two-dimensional heat conduction equations
			CO4	Understand the modified equations of FD formulation
			CO5	Development of codes for various fluid flow and heat transfer problems in C++/Matlab following FDM
60	22ME4076	CFD FOR COMPRESSIBLE AND INCOMPRESSIBLE FLOWS	CO1	Understand the basics of various convective schemes, FVM discretization
			CO2	Solve N-S equations for incompressible flows using stream function – vorticity formulation and Pressure-velocity coupled algorithms
			CO3	Solve N-S equations for compressible flows using MacCormack, Jameson algorithm
			CO4	Understand turbulence modelling
			CO5	Analyze various fluid flow and heat transfer problems using Matlab programming/Ansys – Fluent following FVM
61	22ME4077	THERMAL MANAGEMENT OF ELECTRIC AND ELECTRONIC SYSTEMS	CO1	Apply the concepts of heat transfer to various electric and electronic systems requiring heat dissipation
			CO2	Apply different cooling techniques to microchannels, heat pipes and vapor chambers
			CO3	Apply various thermal management techniques in the fields of automobiles and electronics
			CO4	Analyze the Battery thermal management system and battery pack design
62	22ME4081	ROBOT MOTION, PLANNING DYNAMICS & CONTROL	CO1	Understand the key concepts of robot motion generation.
			CO2	Apply motion of robot in the presence of obstacles
			CO3	Analyze motion planning and control


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			CO4	Perform basic motion, force, and hybrid motion-force control.
63	22ME4082	ROBOT MANIPULATION & WHEELED MOBILE ROBOTS	CO1	Determine various contact kinematics of robot manipulator
			CO2	Analyze contact forces and friction on the performance of manipulator
			CO3	Apply basic principles used in wheeled mobile robots.
			CO4	Understand odometry and mobile manipulation
64	22ME4083	MECHATRONICS: FUNDAMENTALS & CORE CONCEPTS	CO1	Analyze mechatronics in manufacturing and distinguish between traditional and mechatronics approaches
			CO2	Be proficient in the use of Data conversion devices and Microprocessors controllers.
			CO3	Be able to analyze and select suitable drives and mechanisms for industrial applications
			CO4	Design and analyze the Hydraulic systems and understand PID controllers and CNC machines.
65	22ME4084	ARTIFICIAL INTELLIGENCE FOR ROBOTICS	CO1	Understand the concepts of AI
			CO2	Apply basic principles of AI in solutions that require problem- solving
			CO3	Apply basic principles of AI in solutions that require planning
			CO4	Analyze AI in Robotics
			CO5	Apply the theoretical concepts to conduct various experiments on Search Techniques and Language Representation using AI
66	22EC3075	HUMAN MACHINE INTERFACE & BRAIN MACHINE INTERFACE	CO1	Understand the Basic Idea of Human Machine Interactions, and its Goals
			CO2	Describe typical human-computer interaction (HCI) models, styles, and various historic HCI paradigms
			CO3	Understand the Basic Idea of Brain Machine Interactions, and brain waves
			CO4	Apply an interactive design process and universal design principles to designing HCI/BMI systems
67	22EC3074	COMPUTER VISION & APPLICATIONS	CO1	Understanding of the fundamental concepts related to multi-dimensional signal processing.
			CO2	Understanding of the feature extraction, pattern analysis visual geometric modelling, stochastic optimization.
			CO3	Knowledge of these concepts is necessary in this field, to explore and contribute to research and further developments in the field of computer vision.
			CO4	Applications range from Biometrics, Medical diagnosis, document processing, mining of visual content, to surveillance, advanced rendering.
			CO1	Understand the basics of Autonomous Vehicles, dynamics and design electronics to


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68	22EC3072	AUTONOMOUS VEHICLES & AUTOMOTIVE ELECTRONICS		complement those features.
			CO2	To understand sensors and sensor monitoring mechanisms aligned to automotive systems, different signal conditioning techniques, interfacing techniques and actuator mechanisms. To understand role of Microcontrollers in ECU design and choice of appropriate Hardware and Software
			CO3	Describe the function of basic components used in modern automotive systems To provide an overview of the Automotive Open Systems Architecture
			CO4	Design and implement Illustrate the practical applications of Automotive Open Systems Architecture (AUTOSAR)
69	22EE3241	POWER TRAIN DESIGN FOR ELECTRIC VEHICLE	CO1	Understand the History, Economics, Environmental issues and power train of Electric Vehicles
			CO2	Analyze the dynamics of EV
			CO3	Select and size the power train for 2W
			CO4	Select and size the power train for 4W
70	22ME4072	SOLAR ENERGY TECHNOLOGIES	CO1	Understand the basics of solar radiation and working principle of various solar collectors
			CO2	Understand the working of solar thermal systems
			CO3	Understand the fundamentals of Solar PV technology
			CO4	Apply the knowledge of thermodynamics and heat transfer to calculate the performance of solar PV systems
			CO5	Analyze various solar thermal and PV systems using TRNSYS software
71	22ME4091	VEHICLE DYNAMICS	CO1	Analyse the dynamics of Steering system on vehicle performance
			CO2	Analyse Dynamics of vehicle suspension systems
			CO3	Analyse Dynamics of vehicle body vibrations
			CO4	Analyse the 2D stability of automobile vehicles
72	22ME4077	THERMAL MANAGEMENT OF ELECTRIC AND ELECTRONIC SYSTEMS	CO1	Apply the concepts of heat transfer to various electric and electronic systems requiring heat dissipation
			CO2	Apply different cooling techniques to microchannels, heat pipes and vapor chambers
			CO3	Apply various thermal management techniques in the fields of automobiles and electronics
			CO4	Analyze the Battery thermal management system and battery pack design
73	22EE4141	AI & IOT FOR ELECTRIC VEHICLE	CO1	Demonstrate IoT devices and tools
			CO2	Operate the cloud system Environment
			CO3	Utilize AI and ML Techniques

			CO4	Utilize AI techniques for EV Applications
74	22EE4142	COMMUNICATION PROTOCOLS & TESTING OF ELECTRIC VEHICLE	CO1	Analyse the protocols used for Electric Vehicle communica
			CO2	Apply the communication protocols for fault diagnostics of Electric Vehicle
			CO3	Analyze the intricacies of integrating HV and LV components of vehicle
			CO4	Understand the overview of system engineering/system validation
			CO5	Test electric vehicle fault
75	22EC3072	Autonomous Vehicles & Automotive Electronics	CO1	Understand the basics of Autonomous Vehicles, dynamics and design electronics to complement those features.
			CO2	To understand sensors and sensor monitoring mechanisms aligned to automotive systems, different signal conditioning techniques, interfacing techniques and actuator mechanisms.
				To understand role of Microcontrollers in ECU design and choice of appropriate Hardware and Software
			CO3	Describe the function of basic components used in modern automotive systems
CO4	To provide an overview of the Automotive Open Systems Architecture (AUTOSAR)			
	Design and implement Illustrate the practical applications of Automotive Open Systems Architecture (AUTOSAR)			
76	22ME40B4	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.
77	22ME40B5	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.
			CO1	Model and Solve for the optimum solutions using LPP

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78	22ME40B6	OPERATIONS RESEARCH	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
79	22ME40B7	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.
80	22ME40B8	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
81	22ME40B9	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
82	22ME40C1	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
83	22ME40C2	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.
			CO1	Able to appreciate the advantages of ITS
			CO2	Able to suggest the appropriate technologies for field conditions.

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84	22ME40C3	SMART MOBILITY	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
85	22ME40C4	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
			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
86	22ME3217	Operations Management	CO1	Understand about Production planning and predict future demand
			CO2	Apply various production scheduling and sequencing techniques to optimize productivity
			CO3	Apply Material Management and control techniques
			CO4	Apply various quality management and Lean management to various cases



Professor I/C Academics



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