Annamacharya Institute of Technology and Sciences, Tirupati

Department of Mechanical Engineering Course Outcomes(COs)
AK-19 Regulations

Course Title	Course Outcomes (COs)	
Algebra & Calculus	CO1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications
	CO2	Utilize mean value theorems to real life problems
	CO3	Familiarize with functions of several variables which is useful in optimization
	CO4	Students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional coordinate systems
	CO5	Students will become familiar with 3- dimensional coordinate systems and also learn the utilization of special functions
Engineering Chemistry	CO1	Interpret the behaviour and interactions between matter and energy at both the atomic and molecular levels
	CO2	Apply the electrochemical principles to the construction of batteries, fuel cells and electrochemical sensors
	CO3	Outline the preparation, mechanism properties and applications of polymer and conducting polymers.
	CO4	Analyze the separation of gaseous and liquid mixtures using instrumental methods and their applications.
	CO5	Understand the disadvantages of using hard water in domestically and industrially and select suitable treatments
Problem Solving and Programming	CO1	Create interactive visual programs using Scratch.
	CO2	Develop flowcharts using raptor to solve the given problems.
	CO3	Develop Python programs for numerical and text based problems
	CO4	Develop graphics and event based programming using Python
	CO5	Develop Python programs using beautiful Pythonic idiomatic practices
Engineering Workshop Practice	CO1	Apply wood working skills in real world applications.
	CO2	Build different parts with metal sheets in real world applications.
	CO3	Apply fitting operations in various applications.
	CO4	Apply different types of basic electric circuit connections.
	CO5	Demonstrate soldering and brazing.
Engineering Graphics Lab	CO1	Draw various curves applied in engineering.
	CO2	Show projections of solids and sections graphically.
	CO3	Draw the development of surfaces of solids.
	CO4	Use computers as a drafting tool.
	CO5	Draw isometric and orthographic drawings using CAD packages.
Engineering Chemistry Lab	CO1	Determine the cell constant and conductance of solutions
	CO2	Prepare advanced polymer materials
	CO3	Determine the physical properties like surface tension, adsorption and viscosity
	CO4	Estimate the Iron and Calcium in cement

	CO5	Calculate the hardness of water
Problem Solving and Programming Lab	CO1	Create interactive visual programs using Scratch.
	CO2	Develop flowcharts using raptor to solve the given problems.
	CO3	Develop Python programs for numerical and text based problems
	CO4	Develop graphics and event based programming using Python
	CO5	Develop Python programs using beautiful Pythonic idiomatic practices
Basics of Electrical & Electronics Engineering	CO1	Apply concepts of KVL/KCL in solving DC circuits
	CO2	Illustrate working principles of induction motor - DC Motor
	CO3	Identify type of electrical machine based on their operation
	CO4	Describe operation and characteristics of diodes and transistors.
	CO5	Make use of diodes and transistors in simple, typical circuit applications.
	CO6	Understand operation of basic op-amp circuits
Differential Equations and Multivariable Calculus	CO1	Apply the mathematical concepts of ordinary differential equations of higher order.
	CO2	Solve the differential equations related to various engineering fields.
	CO3	Identify solution methods for partial differential equations that model physical processes.
	CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence.
	CO5	Estimate the work done against a field, circulation and flux using vector calculus
Engineering Physics	CO1	Explain physics applied to solve engineering problems
	CO2	Apply the principles of acoustics in designing of buildings
	CO3	Explains the applications of ultrasonic in various engineering fields
	CO4	Apply electromagnetic wave propagation in different Optical Fibers and the concepts of lasers in various applications.
	CO5	Explains the concepts of dielectric and magnetic materials and identify the sensors for various engineering applications
Data Structures	CO1	Select Appropriate Data Structure for solving a real-world problem
	CO2	Select appropriate file organization technique depending on the processing to be done
	CO3	Construct Indexes for Databases
	CO4	Analyse the Algorithms
	CO5	Develop Algorithm for Sorting large files of data
Communicative English I	CO1	Identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English.
	CO2	Formulate sentences using proper grammatical structures and correct word forms.
	CO3	Speak clearly on a specific topic using suitable discourse markers in informal discussions.
	CO4	Write summaries based on global comprehension of reading / listening texts.
	CO5	Produce a coherent paragraph interpreting a figure/graph/chart/table
Communicative English Lab	CO1	Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
	CO2	Apply communication skills through various language learning activities.
	CO3	Analyze the English speech sounds, stress, rhythm, intonation and

		syllable division for better listening and speaking comprehension.
	CO4	Evaluate and exhibit acceptable etiquette essential in social and professional settings.
	CO5	Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English
Mechanical Engineering Workshop	CO1	Make moulds for sand casting
	CO2	Develop different weld joints
	CO3	Assemble or disassemble of machine components
	CO4	Make plastic components
	CO5	Use power tools and find applications of hydraulic and pneumatic circuits
Engineering Physics Lab	CO1	Operate various optical instruments and Estimate wavelength of laser and particles size using laser.
	CO2	Estimate the susceptibility and related magnetic parameters of magnetic materials and plot the intensity of the magnetic field of circular coil carrying current with distance.
	CO3	Evaluate the acceptance angle of an optical fiber and numerical aperture and determine magnetic susceptibility of the material and its losses by B-H curve.
	CO4	Identify the type of semiconductor i.e., n-type or p-type using Hall effect.
	CO5	Apply the concepts of sensors for various applications
Data Structures Lab	CO1	Select the data structure appropriate for solving the problem
	CO2	Implement searching and sorting algorithms
	CO3	Design new data types
	CO4	Illustrate the working of stack and queue
	CO5	Organize the data in the form of files
Probability & Statistics, PDE, Complex Variables	CO1	Apply discrete and continuous probability distributions
	CO2	Design the components of a classical hypothesis test
	CO3	Infer the statistical inferential methods based on small and large sampling tests
	CO4	Find the general solution of the PDEs bearing applications
	CO5	Differentiation and integration of complex functions used in engineering problems To equip the students to solve application problems in their disciplines
Communicative English II	CO1	Prioritize information from reading texts after selecting relevant and useful points
	CO2	Paraphrase short academic texts using suitable strategies and conventions
	CO3	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements
	CO4	Participate in group discussions using appropriate conventions and language strategies
	CO5	Prepare a CV with a cover letter to seek internship/ job
Design Thinking and Product Innovation	CO1	Summarize the importance of basic sciences in product development
	CO2	Explain the historical developments in mechanical, electrical, communications and computational engineering
	CO3	Apply systematic approach to innovative designs
	CO4	Identify new materials and manufacturing methods in design
	CO5	Explain and study of Product Development
Engineering Mechanics	CO1	Resolve forces and moments in mechanical systems.

	CO2	Identify the frictional forces and its influence on equilibrium.
	CO3	Find the centre of gravity and moment of inertia for various geometric shapes
	CO4	Demonstrations of equilibrium of ideal systems and estimation of the work done by the force and the couple
	CO5	Determine the displacement, velocity and acceleration relations in dynamic systems
Material Science and Engineering	CO1	Explain the principles of binary phases
	CO2	Apply heat treatment to different applications
	CO3	Select steels and cast irons for a given application
	CO4	Utilize nonferrous metals and alloys in engineering
	CO5	Choose composites for various applications. Assess the properties of nano-scale materials and their applications
Thermodynamics	CO1	Explain the importance of thermodynamic properties related to conversion of heat energy into work.
	CO2	Apply the laws of thermodynamics to boilers, heat pumps, refrigerators, heat engines, compressors and nozzles.
	CO3	To understand concept of Entropy and Availability of system
	CO4	Utilize steam properties to design steam based components.
	CO5	Compare thermodynamic relations and air standard cycles.
Environmental Studies	CO1	Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
	CO2	Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self-learning.
	CO3	Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
	CO4	Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage
	CO5	To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting
Communicative English II Lab	CO1	Prioritize information from reading texts after selecting relevant and useful points.
	CO2	Make formal structured presentations on academic topics using PPT slides with relevant graphical elements.
	CO3	Participate in Group discussions using appropriate conventions and language strategies.
	CO4	Paraphrase short academic text using suitable strategies and conventions.
	CO5	Collaborate with a partner to make presentations and Project
Design Thinking and Product Innovation Lab	CO1	Summarize the importance of basic sciences in product development
	CO2	Explain the historical developments in mechanical, electrical, communications and computational engineering
	CO3	Apply systematic approach to innovative designs
	CO4	Identify new materials and manufacturing methods in design
	CO5	Explain and study of Product Development
Material Science and Engineering Lab	CO1	Identify various microstructures of steels and cast irons.
	CO2	Visualize grains and grain boundaries
	CO3	Evaluate hardness of treated and untreated steels.

	CO4	Summarize the importance of hardening of steels.
	CO5	Study the Micro structure of Heat treated steels.
Computer Aided Machine Drawing Lab	CO1	Demonstrate the conventional representations of materials and machine components
	CO2	Model riveted, welded and key joints using CAD system
	CO3	Create solid models and sectional views of machine components
	CO4	Generate solid models of machine parts and assemble them
	CO5	Create manufacturing drawing with dimensional and geometric tolerances
Transform Techniques and Numerical Methods	CO1	Apply the Laplace transform for solving differential equations (continuous systems)
	CO2	Find the Fourier series of periodic signals
	CO3	Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms
	CO4	Solve linear/nonlinear algebraic and transcendental equations using numerical methods
	CO5	Solve ordinary differential equations by Euler's method, modified Euler's method, Runge Kutta method, Predictor Corrector method and Milne's method
Kinematics of Machinery	CO1	To enable the students in selection of appropriate mechanisms.
	CO2	To impart the clear idea in constructing velocity & acceleration diagrams for the given mechanism.
	CO3	To provide an overview of straight line motion mechanisms, steering mechanisms and Hooke’s joint.
	CO4	To understand the kinematic analysis of gears & gear trains.
	CO5	To develop the knowledge of kinematic analysis of cams.
Internet of Things (IoT)	CO1	Interpret the vision of IoT from a global context
	CO2	Determine the Market perspective of IoT
	CO3	Compare and Contrast the use of Devices, Gateways and Data Management in IoT
	CO4	Implement state of the art architecture in IoT
	CO5	Illustrate the application of IoT in Industrial Automation and identify Real World Design Constraints
Mechanics of Materials	CO1	Apply the concepts of stress and strain to machine numbers
	CO2	Determine, shear forces, and bending moments in beams
	CO3	To find slope and deflection in beams, determine shear forces and bending moments in beams
	CO4	Estimate the stresses in machine members such as shafts and springs and design
	CO5	Estimate the stresses in thin cylinders due to internal pressure
Manufacturing Technology	CO1	Demonstrate different metal casting processes and gating systems
	CO2	Classify working of various welding processes
	CO3	Evaluate the forces and power requirements in rolling process
	CO4	Apply the principles of various forging operations
	CO5	Outline the manufacturing methods of plasticsand ceramics.
Fluid Mechanics & Hydraulic Machinery	CO1	Interpret the behavior under static and dynamic conditions.
	CO2	analyze one dimensional viscous flows using conservation laws for compressible and incompressible flows.
	CO3	apply boundary layer flows for laminar and turbulent regimes.
	CO4	explain Reynolds stresses and its application

	CO5	explain different types of pumps and their application.
Biology for Engineers	CO1	Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
	CO2	Explain about biomolecules, their structure, function and their role in the living organisms. How biomolecules are useful in Industry.
	CO3	Brief about human physiology.
	CO4	Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
	CO5	Know about application of biological principles in different technologies for the production of medicines and pharmaceutical molecules through transgenic microbes, plants and animals
Fluid Mechanics & Hydraulic Machinery Lab	CO1	Interpret the behavior under static and dynamic conditions.
	CO2	Analyze one dimensional viscous flows using conservation laws for compressible and incompressible flows.
	CO3	apply boundary layer flows for laminar and turbulent regimes.
	CO4	explain Reynolds stresses and its application
	CO5	explain different types of pumps and their application
Internet of Things Lab (IoT Lab)	CO1	Choose the sensors and actuators for an IoT application.
	CO2	Select protocols for a specific IoT application.
	CO3	Utilize the cloud platform and APIs for IoT application.
	CO4	Experiment with embedded boards for creating IoT prototypes
	CO5	Design a solution for a given IoT application
Manufacturing Technology Lab	CO1	Fabricate different types of components using various manufacturing techniques.
	CO2	Carry out Pattern preparation and Estimate the Sand properties
	CO3	Carry out the Welding process to join the components
	CO4	Carry out Blanking & Piercing operation
	CO5	Adapt material forming methods.
Dynamics of Machines	CO1	To understand the application of friction in pivots, collars, clutches, brakes, and dynamometers, and also to solve the numerical problems
	CO2	To understand gyroscopic effect on Aeroplane, ship, four wheel and two-wheel vehicles. To design a flywheel for reciprocating engine and punching press.
	CO3	To understand the working of various types of governors and to analyze the forces acting on them. To solve numerical problems on balancing of rotating masses
	CO4	To understand that effect of primary and secondary balancing of reciprocating masses in locomotive engines, V-engine, inline engines and Radial engines
	CO5	To understand the concept of different types of vibratory systems and to perform simple calculations of vibration systems
Thermal Engineering – I	CO1	To student can know working of both S.I and C.I engines with the help of indicator diagrams.
	CO2	Student can understand the fuel supply systems, cooling, lubrication and ignition systems
	CO3	Student can understand the flame propagation inside the cylinder, stages of combustion in S.I and C.I engines
	CO4	To familiar with indicated power, brake power and friction power and their methods of measurement
	CO5	The working of reciprocating and rotary air compressors. Student can calculate work done by single and multistage reciprocating air compressors.
Design of Machine Members – 1	CO1	To apply design procedures using theories of failure for different

		elements
	CO2	Able to design simple components under cyclic loading using Goodman's and Soderberg's criterions
	CO3	Able to design riveted joints with different configuration, boiler shell joint design and eccentric loading design of riveted joints
	CO4	To design cotter joint, knuckle joint and shafts
	CO5	To design various rigid and flexible shaft couplings
Machine Tools	CO1	To understand the basic concepts of the philosophy of metal cutting and the mechanism of chip formation
	CO2	To understand the basic concepts of turning.
	CO3	To understand the basic principle of drilling, shaping and planning operation, parts of the drilling
	CO4	To able to understand the principle of milling, grinding, Lapping, Honing and Broaching operation
	CO5	Tto understand the design of Jigs and fixtures and uses, Classification of Jigs & Fixtures – Principles of location and clamping
Nano Technology	CO1	To identify the essential concepts used in nanotechnology
	CO2	To identify the materials, properties
	CO3	To Derive charecterization techniques
	CO4	To Characterization of carbon allotropes, synthesis of diamond.
	CO5	To derive Applications in material science, biology and medicine.
Composite materials	CO1	To study matrix material, reinforcements of polymer matrix composites, MMC and ceramic matrix composites..
	CO2	To develop knowledge on manufacturing methods of composites
	CO3	To develop knowledge on processing techniques and applications of PMCs
	CO4	To develop knowledge on processing techniques and applications of PMCs
	CO5	To develop knowledge on processing techniques and applications of CMCs and Carbon- carbon composites
Renewable Energy Technologies	CO1	Explain the current energy scenario and requirement of migration to renewable energy sources
	CO2	To understand role significance of solar energy
	CO3	To provide importance of Wind Energy
	CO4	To understand the role of ocean energy in the Energy Generation
	CO5	To understand role of hydrogen in non conventional energy
Managerial Economics and Financial Analysis	CO1	Understand the fundamentals of Economics and Managerial economics viz., Demand, Production, cost, revenue and markets.
	CO2	Apply the Concept of Production cost and revenues for effective Business decision
	CO3	Analyze how to invest their capital and maximize returns.
	CO4	Evaluate the capital budgeting techniques.
	CO5	Define the concepts related to financial accounting and management and able to develop the accounting statements and evaluate the financial performance of business entity
Artificial Intelligence	CO1	Apply searching techniques for solving a problem
	CO2	Design Intelligent Agents
	CO3	Develop Natural Language Interface for Machines
	CO4	Design mini robots
	CO5	Summarize past, present and future of Artificial Intelligence

Sensor Networks	CO1	Understand the concepts of Converters and Sensor data acquisitionsystems
	CO2	Understand the concepts of Sensor Measurements in Structural Monitoring
	CO3	Understand the concepts of commonly used sensing technologies and algorithms
	CO4	Understand the concepts of Piezoelectric transducers for assessing and monitoring infrastructures
	CO5	Understand the concepts of Fiber optic sensors for assessing and monitoring infrastructures
Constitution of India	CO1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
	CO2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
	CO3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
	CO4	Discuss the Powers and functions of Governor, President, Judiciary.
	CO5	Discuss the functions of local administration bodies
Thermal Engineering Lab	CO1	Understand different parts and mechanisms of IC Engine.
	CO2	To understand the working principle of two and four stroke of IC Engine.
	CO3	To understand the working principle and operation of diesel and petrol engine.
	CO4	TO evaluate the performance characteristics of IC Engine and air compressor.
	CO5	To understand measurements of engine emissions and study of boilers.
Machine Tools Lab	CO1	To apply knowledge of tool materials and cutting fluids in the machine shop
	CO2	To develop the hands-on experience on different machining processes that will enable them to work in a typical machine shop.
	CO3	To apply knowledge of metal cutting parameters, tool wear mechanisms
	CO4	To understand the basic calculations of machining parameters.
	CO5	To develop the practical knowledge on groove cutting, gear cutting
Computer Aided Drafting Lab	CO1	To understand the basic elements of Computer Aided Drafting
	CO2	To aquire knowledge of drafting packages
	CO3	To understand the drafting features
	CO4	To practice drafting of solids and perspective views
	CO5	To practice drafting of Orthographic views
Design of Machine Members – II	CO1	To design crane hooks, C-clamps and various belt, rope and chain drives
	CO2	Design helical sprigs for two-wheel vehicle and laminated springs for trucks
	CO3	Design journal bearings, ball bearings and roller bearings and to know the advantages of rolling contact bearings
	CO4	Design spur and helical gears for different input conditions
	CO5	Design engine components like Cylinder, piston, connecting rod and crankshaft
Heat Transfer	CO1	To understand the concept of modes of heat transfer and to solve problems on conduction heat transfer.

	CO2	To understand heat transfer through extended surfaces and solve the problems in 1-D transient conduction heat transfer.
	CO3	To understand concept of the convection heat transfer and to solve practical problems on forced and natural convection heat transfer.
	CO4	Calculate heat transfer in boiling, condensation and understand principle behind heat exchangers and solve problems using LMTD and NTU methods.
	CO5	Understand basic concepts of radiation heat transfer from black and gray bodies and solve problems involving radiation shields.
Thermal Engineering – II	CO1	To understand efficiency enhancement methods of Reheating and regeneration. Student can able to understand the key role of quality of steam after evaporation
	CO2	To able to understand the working of different high pressure and low-pressure boilers.
	CO3	To able to distinguish the ideal flow and actual flow through nozzle. Student can know the importance of maximum discharge through nozzle.
	CO4	To construct the velocity triangle and combined velocity triangle and can learn its importance in determining the power produced by the turbine.
	CO5	To participate in science exhibitions based on the concept of thermal power plants.
Management Science	CO1	Understand the concepts & principles of management and designs of organization in a practical world.
	CO2	Apply the knowledge of Work-study principles & Quality Control techniques in industry.
	CO3	Analyze the concepts of HRM in Recruitment, Selection and Training & Development.
	CO4	Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT.
	CO5	Create Modern technology in management science
Optimization Techniques	CO1	Explain the need of optimization of engineering systems
	CO2	Understand optimization of electrical and electronics engineering problems
	CO3	Apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
	CO4	Apply unconstrained optimization and constrained non-linear programming and dynamic programming
	CO5	Formulate optimization problems
Introduction to CAD/CAM	CO1	Understand the basic concepts components of CAD/CAM. Concepts of Graphics techniques.
	CO2	Understand the concepts of Geometric representation methods..
	CO3	Understand and apply Numerical CNC Part Programming methods.
	CO4	Understand the concepts of Group technology and techniques, production flow Analysis.
	CO5	Understand the concepts of FMS and its elements.
Machine Learning	CO1	Understand the concepts of computational intelligence like machine learning
	CO2	Ability to get the skill to apply machine learning techniques to address the real time problems in different areas
	CO3	Understand the Neural Networks and its usage in machine learning application
Neural Networks and Fuzzy Logic	CO1	Understand the basic architecture of artificial neural network terminologies and techniques.
	CO2	Understand approaches and architectures of Artificial Intelligence.

	CO3	Perform the training of neural networks using various learning rules.
	CO4	Create different neural networks of various architectures both feed forward and feed backward.
	CO5	Application of ANN to System Identification and Pattern recognition.
Structural Helath Monitoring	CO1	Learn about failure and damage detection
	CO2	Study the structural health monitoring in civil engineering structures
	CO3	Know about Sensor technology in civil engineering
	CO4	Study the IOT in SHM
	CO5	Learn about Real time SHM application
Principles of Effective Public Speaking	CO1	Gain and demonstrate the basic skills of effective oral communication, for use throughout your academic career and beyond.
	CO2	Learn and develop the skills necessary to maximize public speaking effectiveness, including effective research and organization of information, how to make the most of presentation aids (and not become reliant on them!), and understanding the speaker-audience relationship.
	CO3	Develop critical thinking and listening skills, enabling you to maximize your own understanding as an audience member, and offer considered and constructive critiques of others' speeches.
	CO4	Become more confident in public speaking arenas, whether as a formal speech giver or as a participant in group settings. Improvement will be valued over perfection.
Advanced Numerical Methods	CO1	Understand the Formulation Techniques for solving problems used in engineering problems.
	CO2	Apply the Curve Fitting procedures and understand Regression concept.
	CO3	Analyses the Iterative methods of solving problems in Partial differential equations.
	CO4	Know and be able to apply the procedure of solving the solution of Parabolic Equations.
	CO5	Develop to solve techniques for solving problems in Hyperbolic partial differential equations. using
Electromagnetic Theory	CO1	Analyze electrostatics with their related theorems.
	CO2	Illustrate electrostatics in matter by dielectrics and their properties.
	CO3	Analyze Magnetostatics with mathematical proofs.
	CO4	Analyze Maxwell's equations and Electromagnetic wave propagation.
	CO5	Enumerate the applications of Electromagnetic wave propagation
Professional Ethics and Human Values	CO1	It ensures students sustained happiness through identifying the essentials of human values and skills.
	CO2	The students will understand the importance of Values and Ethics in their personal lives and professional careers.
	CO3	The students will learn the rights and responsibilities as an employee, team member and a global citizen.
	CO4	Students understand practically the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
	CO5	Students can able to develop appropriate technologies and management patterns to create harmony in professional and personal life
Heat Transfer Lab	CO1	Estimate heat transfer coefficients in forced and natural convection and determine the effectiveness of heat exchangers and heat pipe.
	CO2	Perform the transient heat conduction experiment and obtain the variations of temperature along length of pin-fin.
	CO3	To determine overall heat transfer coefficient for composite walls

	CO4	Perform experiment to determine thermal conductivity of metal rod.
	CO5	Perform radiations experiments and determine the surface emissivity and Stefan boltzman's constant and compare the theoretical values.
Design & Simulation Lab	CO1	Design of 2D models using software
	CO2	Design of 3D models and analysis
	CO3	Create simulation of any simple components
	CO4	Design and simulation of machine components
	CO5	Analysis of any components using software
Metrology and Measurements	CO1	Identify techniques to minimize the errors in measurement.
	CO2	Identify methods and devices for measurement of length, angle, gear & thread parameters, surface roughness and geometric features of parts.
	CO3	Understand working of lathe, shaper, planer, drilling, milling and grinding machines.
	CO4	Comprehend speed and feed mechanisms of machine tools.
	CO5	Estimate machining times for machining operations on machine tools
Operations Research	CO1	Able to create mathematical models of the real-life situations and capable of obtaining best solution using Graphical Method and Simplex Method
	CO2	To implement the theory of duality for simplifying the solution procedure for certain LPPs, and solve the special cases of LPP and Assignment problems
	CO3	Knowledge of choosing the best strategy out of the available strategies which is an essential skill for any business manager to successfully face the competition
	CO4	Able to represent any project in the form of a network and estimate the parameters like Project Completion Time
	CO5	Applying Dynamic Programming technique to solve the complex problems by breaking them into a series of sub-problems
Automobile Engineering	CO1	Recognize the various parts of the automobile and their functions and materials.
	CO2	Discuss the engine auxiliary systems and engine emission control.
	CO3	Distinguish the working of different types of transmission systems.
	CO4	Explain the Steering, Brakes and Suspension Systems.
	CO5	Predict possible alternate sources of energy for IC Engines
Refrigeration & Air Conditioning	CO1	Illustrate the fundamental principles and applications of refrigeration and air conditioning system.
	CO2	Obtain cooling capacity and coefficient of performance by conducting test on vapour compression refrigeration systems.
	CO3	Present the properties, applications and environmental issues of different refrigerants
	CO4	Calculate cooling load for air conditioning systems used for various
	CO5	Operate and analyze the refrigeration and air conditioning systems
Finite Element Analysis	CO1	Summarize the basics of finite element formulation.
	CO2	Apply finite element formulations to solve one dimensional Problems.
	CO3	Apply finite element formulations to solve two dimensional scalar Problems.
	CO4	Apply finite element method to solve two-dimensional Vector problems.

	CO5	Apply finite element method to solve problems on iso parametric element and dynamic Problems.
Computational Fluid Dynamics	CO1	Provide the student with a significant level of experience in the use of modern CFD software for the analysis of complex fluid-flow systems
	CO2	Apply the various discretization methods, solution procedures and turbulence modeling to solve flow and heat transfer problems
	CO3	Express numerical modeling and its role in the field of fluid flow and heat transfer
	CO4	Illustrate the working concepts of thermal engineering
	CO5	Improve the student's understanding of the basic principles of fluid mechanics
Power Plant Engineering	CO1	Discuss the basic terminology and concepts involved in the power generation calcualtions.
	CO2	Analyze the working and layout of steam power plants and the different systems comprising the plant and discuss about its economic and safety impacts
	CO3	Combine concepts of previously learnt courses to define the working principle of diesel power plant, its layout, safety principles and compare it with plants of other types
	CO4	Discuss the working principle and basic components of the hydro electric plants and the economic principles and safety precautions involved with it.
	CO5	Discuss and analyze the working principles of different non conventional sources involved in the power generation.
Simulation Modelling for Manufacturing Systems	CO1	Students gain knowledge on various types of simulation and simulation languages steps in simulation and applications of simulation
	CO2	Students gain knowledge on parameter estimation and hypothesis
	CO3	Students can build simulation model and also can validation and verify model
	CO4	Can Generation of random variants and variables
	CO5	Applications of simulation and systems
Advanced Mechanics	CO1	Study of elements of mechanisms in different geometry.
	CO2	Study and construction of kinematics of plane motions
	CO3	Design and determination of different mechanisms in advanced kinematics of plane motion.
	CO4	Study and analysis of synthesis graphical method
	CO5	Design of different functions and methods of graphical method and theorems.
Effective Technical Communication	CO1	Understand the importance of effective technical communication
	CO2	Analyze non-verbal language suitable to different situations in professional life
	CO3	Evaluate different kinds of methods used for effective presentations
	CO4	Create trust among people and develop employability skills
	CO5	Develop skills in speech composition
Technical Writing	CO1	To acquaint students with a variety of forms of writing in science and technology;
	CO2	Develop research skills;
	CO3	Discuss and apply writing and formatting techniques
Organizational Behaviour	CO1	Understand the nature and concept of Organizational behavior.
	CO2	Familiar with the motivational theories.
	CO3	Able to understand leadership theories and qualities.

	CO4	Learn about group dynamics
Metrology and Measurements Lab	CO1	Identify techniques to minimize the errors in measurement.
	CO2	Identify methods and devices for measurement of length, angle, gear & thread parameters, surface roughness and geometric features of parts.
	CO3	Understand working of lathe, shaper, planer, drilling, milling and grinding machines.
	CO4	Comprehend speed and feed mechanisms of machine tools.
	CO5	Estimate machining times for machining operations on machine tools