AK-20 Regulations

I Year I SEM		
Course Title	**Course Outcomes (COs)**	
Algebra and Calculus 20ABS9901	CO1	Apply the matrix algebra techniques for solving various linear equations
	CO2	Analyze the linear transformations of quadratic forms and importance of mean value theorems.
	CO3	Apply the fundamental concepts of partial derivatives for multi variable functions.
	CO4	Evaluate the multiple integrals in Cartesian, polar, cylindrical, and spherical co-ordinate systems.
	CO5	Evaluate the improper integrals using special functions like Beta and Gamma.
Engineering Physics 20ABS9903	CO1	Analyze the fundamental concepts of mechanics and gravitation.
	CO2	Apply the basic principles of acoustics and ultrasonics for engineering problems.
	CO3	Analyze the properties and applications of dielectric and magnetic materials.
	CO4	Analyze the fundamentals of Lasers and optical fibers.
	CO5	Analyze the working principles of sensors for engineering problems.
Basics of Electrical & Electronics Engineering 20AES0202	CO1	Apply the concepts of Kirchhoff Laws and the basic theorems for Electrical Circuits.
	CO2	Analyze the operational characteristics of D.C motor, generator, induction motor and transformer.
	CO3	Understand the basic operation of Electrical Power generation and transmission systems.
	CO4	Understand the fundamental concepts of diodes, transistors and op-amps.
	CO5	Analyze the concepts of Number Systems, Logic Gates and Digital Circuits.
	CO6	Understand the basic concepts and examples of Communication Systems.
Engineering Graphics 20AES0301	CO1	Apply the concepts of engineering curves for technical drawing
	CO2	Understand the quadrant system to locate the position of points and projection of lines
	CO3	Analyze the projection of planes as well as solids located in quadrant system
	CO4	Analyze the sectional views and development of surfaces of regular solids
	CO5	Apply orthographic and isometric projections concepts to construct the given object.
Problem Solving and Programming 20AES0501	CO1	Understand the Programming and Algorithms concepts to Perform Basic operations.
	CO2	Apply the problem solving approaches to generate different algorithms.
	CO3	Understand the various operators to perform mathematical operations.
	CO4	Apply the Pointers and Array Techniques to manipulate the data.

	CO5	Analyze the Sorting and Searching Techniques to arrange the data in sorted order
Engineering Physics Lab 20ABS9908	CO1	Analyze the properties of LASER and optical fibers.
	CO2	Analyze the mechanical behavior of a given material using dynamic methods.
	CO3	Evaluate the basic parameters of a given semiconductor material.
	CO4	Analyze the basic properties of dielectric and magnetic behavior of the given material.
	CO5	Apply the concepts of sensors to solve engineering problems.
Basics Electrical & Electronics Engineering Lab 20AES0204	CO1	Apply the Kirchhoff's Laws and Superposition theorem for DC circuits.
	CO2	Analyze the performance of AC and DC Machines by various testing methods.
	CO3	Analyze the speed of DC shunt motor using armature and field control methods.
	CO4	Analyze the V-I Characteristics of pn-diode and zener diode.
	CO5	Evaluate the parameters of rectifiers with and without filters
	CO6	Analyze the input and output characteristics of BJT and FET.
Problem Solving and Programming Lab 20AES0503	CO1	Analyze the basics of computer and concepts of C for writing simple programs.
	CO2	Analyze the control statements for solving the problems using C
	CO3	Design the algorithm for implementing complex problems using C.
	CO4	Analyze the arrays to store and retrieve the elements.
	CO5	Apply the different sorting techniques for solving real world problems.

I Year II SEM

Differential Equations and Vector Calculus 20ABS9906	CO1	Analyze the mathematical concepts of ordinary differential equations of higher order.
	CO2	Apply the methods of linear differential equations related to various engineering problems.
	CO3	Analyze the partial differential equations of first and higher order.
	CO4	Understand the vector differential operators such as gradient, curl, divergent.
	CO5	Evaluate the vector integral theorems by using line, surface, and volume integrals.
ENGINEERING CHEMISTRY 20ABS9905	CO1	Apply the purification technique to remove hardness of water and to check the quality of water
	CO2	Apply the electrochemical principles to the energy storage devices and corrosion prevention techniques
	CO3	Analyze the preparation and applications of polymers and fuels
	CO4	Apply the cement and concrete techniques in manufacturing process for engineering fields
	CO5	Analyze the properties and applications of colloids and nano materials
COMMUNICATIVE ENGLISH 20AHS9901	CO1	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English (Listening and Writing)
	CO2	Apply the grammatical structures to formulate sentences and correct word forms (Grammar)
	CO3	Analyze the discourse markers to speak clearly on a specific topic in informal discussions (Speaking)
	CO4	Evaluate the reading/listening texts and to write summaries based on global comprehension of these texts.(Reading and Writing)
	CO5	Create the coherent paragraph interpreting a figure/graph/chart/table (Writing)

Basics of Python Programming 20AES0509	CO1	Understand the Basic concepts of python programming to build scripts in IDLE.
	CO2	Apply the modularity techniques to invoke user-defined functions.
	CO3	Apply the concept of Strings and Lists to perform iterative operations on data
	CO4	Apply the Mutable and Immutable data types to perform python Programs.
	CO5	Analyze the oops concepts to develop applications with reusability
Engineering Workshop Practice 20AES0304	CO1	Understand the workshop tools and operational capabilities.
	CO2	Apply the wood working skills to prepare different joints.
	CO3	Apply the sheet metal operations to prepare different components in real world applications.
	CO4	Apply the fitting operations for various applications.
	CO5	Apply the basic electrical engineering knowledge for house wiring practice
Communicative English Lab 20AHS9902	CO1	Evaluate the awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.
	CO2	Understand the different aspects of the language with emphasis on LSRW skills and make use of different strategies in discussions.
	CO3	Apply the knowledge of vocabulary and skills in various language learning activities.
	CO4	Analyze the speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
	CO5	Evaluate the acceptable etiquette essentials in social and professional presentations.
Engineering Chemistry Lab 20ABS9910	CO1	Apply the internal and external indicators in volumetric analysis.
	CO2	Analyze the preparation and applications of advanced polymer materials.
	CO3	Analyze the mixture of components by chromatographic techniques.
	CO4	Apply the analytical and electro analytical technique to measure the strength of acids.
	CO5	Evaluate the physical properties like surface tension, adsorption and viscosity.
Basics of Python Programming Lab 20AES0510	CO1	Analyze the basic concepts of Python Programming
	CO2	Apply the loops and conditional statements of python using IDLE and programs.
	CO3	Analyze the compound data using Lists, Tuples and dictionaries using functions.
	CO4	Apply the development applications using python data types to read and write data from files.
	CO5	Design the solutions using OOPs concepts for real world problems in python.
Constitution of India 20AMC9902	CO1	Understand the historical background of the Constitution making and its importance for building a democratic India.
	CO2	Remember the basic features of Indian Constitution
	CO3	Understand the fundamental rights and duties for becoming a good citizen of India.
	CO4	Understand the Powers and functions of Governor, President, and Judiciary.
	CO5	Understand the functions of local administration bodies.
II YEAR I SEM		

Probability and Statistics, Partial Differential Equation 20ABS9913	CO1.	Understand the discrete and continuous data through statistical methods.
	CO2.	Analyze the fundamental laws of probability and its applications.
	CO3.	Apply the formulation of null hypothesis to large samples.
	CO4.	Apply the techniques for testing of hypothesis for small samples.
	CO5.	Analyze the applications of partial differential equations in Cartesian coordinates
Thermodynamics 20APC0308	CO1.	Apply the thermodynamic and steam properties to derive the steam based problems
	CO2.	Analyze the laws of thermodynamics to heat-pumps, heat engines, and refrigerators
	CO3.	Understand the concepts of entropy, availability, and irreversibility of the systems
	CO4.	Analyze the concepts of ideal gas equation, gas and vapour mixture and perfect gases
	CO5.	Evaluate the TdS equations and Maxwell relations.
Engineering Mechanics 20APC0301	CO1.	Understand the fundamentals on different forces and relative motions of mechanisms
	CO2.	Analyze the variable forces on surfaces of mechanism and strengthen the frames.
	CO3.	Evaluate the balancing of mechanisms for improving working efficiency of mechanisms.
	CO4.	Analyze the principles of least action to study of forces and movement of mechanical systems.
	CO5.	Evaluate the external and internal efficiency of mechanisms through different kinds of principles.
Material Science and Engineering 20APC0306	CO1.	Understand the principles of crystal structure and binary phases of metals and alloys
	CO2.	Apply the heat treatment techniques to steels
	CO3.	Analyze the micro-structural characteristics of steels and cast irons for industrial applications
	CO4.	Analyze the micro-structural characteristics of nonferrous metals and alloys
	CO5.	Understand the structure, properties, and applications of polymers, ceramics and composites
Machine Drawing 20APC0303	CO1.	Understand the concepts of conventional representation of materials and machine elements
	CO2.	Apply the drawing skills to design (build/develop) the machine elements and simple components
	CO3.	Analyze the assembly views for the part drawing of the machine and engine parts
Material Science and Engineering Lab 20APC0307	CO1.	Analyze the microstructure of steels and cast irons.
	CO2.	Analyze the microstructure of Nonferrous Alloys and heat treated steels.
	CO3.	Evaluate the hardenability of steels by Jominy End Quench Test.
	CO4.	Evaluate the hardness of treated and untreated steels.
	CO5.	Analyze the microstructure of ceramics and polymeric materials.
Mechanical Engineering Workshop Practice 20APC0313	CO1.	Analyze the average grain size of sand and patterns for producing components through sand-casting process.
	CO2.	Apply the different welding techniques to join the metal components

	CO3.	Analyze the process of assembling and disassembling the Two wheeler
	CO4.	Create the simple plastic components using appropriate fabrication techniques
	CO5.	Apply the power tools in real time applications
CAD Lab 20APC0324	CO1.	Understand the basic concepts of computer aided drafting software.
	CO2.	Analyze the fundamental drafting features for making a Part-Design using CAD software.
	CO3.	Apply the knowledge of draw and modify tools for designing components using CAD packages.
	CO4.	Apply the computer aided drafting software concepts to design the solids and intersections in three dimensions.
	CO5.	Analyze the perspective and orthographic views in computer aided drafting software.
CATIA 20ASC0301	CO1.	Create any simple 2D models using CATIA software.
	CO2.	Create various 3D models using any CAD software packages.
	CO3.	Create simulation of any simple machine components
Environmental Studies 20AMC9903	CO1.	Understand the multidisciplinary nature of environmental studies, various renewable and nonrenewable resources.
	CO2.	Understand the ecosystem and biodiversity to solve complex environmental problems
	CO3.	Apply the various types of pollution, solid waste management, and related preventive measures
	CO4.	Apply the rainwater harvesting, watershed management, ozone layer depletion, and wasteland reclamation.
	CO5.	Analyze the population explosion and impact of environmental health issues on human being.

II YEAR II SEM

Internet of Things 20AES0505	CO1.	Understand the vision of IoT from the Global Context.
	CO2.	Understand the concept of market perspective in M2M and IoT.
	CO3.	Understand the M2M and IoT Technology Fundamentals.
	CO4.	Analyze the Architectures of IoT in ETSI, IETF, ITU-T.
	CO5.	Apply the real world design Constraints and Industrial Automation.
Thermal Engineering 20AES0324	CO1.	Understand the working of S.I and C.I engine.
	CO2.	Apply the fuel and cooling system for I.C engine.
	CO3.	Analyze the normal and abnormal combustion system as well as fuel rating system.
	CO4.	Analyze the testing performance of I.C engines.
	CO5.	Understand the working of air compressor, gas turbines, and jet propulsion system.
Manufacturing Technology 20APC0312	CO1.	Analyze the steps of casting process in fabrication of metals.
	CO2.	Apply the principles of rolling and extrusion techniques for fabrication of metals.
	CO3.	Apply the principles of forging and sheet metal forming methods for fabrication of metals.
	CO4.	Analyze the various welding types and joints for joining of metals.

	CO5.	Analyze the steps in processing and molding of plastics.
Mechanics of Materials 20APC0302	CO1.	Apply the concepts of stresses-strains to various machine elements
	CO2.	Evaluate the shear forces, bending moments and bending stresses in the beams
	CO3.	Analyze the deflection of beams subjected to different loading conditions using various methods.
	CO4.	Analyze the torsional and shear stress distributions for different cross section of beams
	CO5.	Evaluate the buckling loads for columns and stresses in thin cylinders subjected to internal pressure.
MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS 20AHSMB01	CO1.	Understand the fundamentals of managerial economics and demand concept.
	CO2.	Understand the production and cost concepts to optimize the output
	CO3.	Analyze the price output relationship in different markets.
	CO4.	Evaluate the capital budgeting techniques to invest in various projects.
	CO5.	Analyze the accounting statements to evaluate the financial performance of business entity.
Universal Human Values 20AHS9905	CO1.	Understand the essentials of human values, self-exploration, happiness and prosperity for value added education.
	CO2.	Analyze the harmony in the human being as sentient 'I' and the material 'Body' in various aspects.
	CO3.	Apply the nine universal human values in relationships for harmony in the family and orderliness in the society.
	CO4.	Evaluate the interconnectedness of four orders of nature and holistic perception of harmony at all levels of existence.
	CO5.	Apply the holistic understanding of harmony on professional ethics through augmenting universal human order.
Internet of Things Laboratory (IoT Lab) 20AES0506	CO1.	Analyze the parameter of Analog and digital sensors using Development board.
	CO2.	Evaluate the various actuators using Bluetooth communication technology.
	CO3.	Analyze the sensor data-using socket Communication and Local Area Network.
	CO4.	Analyze the sensor and actuator data using cloud platform.
	CO5.	Create a prototype design to solve local area issues.
Thermal Engineering Lab 20APC0326	CO1.	Analyze the functioning and performance of an 2-stroke and 4 -Stroke engine
	CO2.	Evaluate the fuel supply, cooling, lubrication, and ignition systems of an IC engine
	CO3.	Analyze the flame propagation and combustion of S.I and C.I engines and functioning of boilers.
	CO4.	Evaluate the indicated power, brake power, friction power, and their methods of measurement
	CO5.	Analyze the volumetric efficiency of multistage reciprocating air compressors.
Mechanics of Materials Lab 20APC0304	CO1.	Evaluate the stress, strain, compression, and shear properties of a material by using UTM.
	CO2.	Analyze the bending strength of simply supported and cantilever beams.
	CO3.	Analyze the torsional rigidity and stiffness constant of the materials.
	CO4.	Evaluate the hardness of a specimen using hardness-testing machine.
	CO5.	Evaluate the impact strength of the materials using impact-testing machine.
Manufacturing Process Lab	CO1.	Evaluate the strength and permeability of moulding sand

20ASC0302	CO2.	Create the patterns and gating systems in different casting techniques for production of component
	CO3.	Apply the different types of welding techniques to join the metal components
	CO4.	Apply the Blanking and Piercing operations in sheet metal processing
	CO5.	Apply the Hydraulic Press for bending and drawing operations in fabrication of a component

III YEAR I SEM

Machine Tools 20APC0327	CO1.	Understand the theory of metal cutting for machining the components.
	CO2.	Apply the principles of lathe for machining the different parts.
	CO3.	Analyze the working of drilling, boring, shaping and planning machines to perform various operations.
	CO4.	Analyze the working of milling, grinding, lapping, honing and broaching machines for surface finishing of components.
	CO5.	Analyze the jigs, fixtures, location and clamping to hold work and tools in various machines.
Kinematics of Machines 20APC0309	CO1.	Analyze different mechanisms, inversions of different kinematic chains and mobility of mechanisms.
	CO2.	Analyze the velocity and acceleration diagrams of simple plane mechanisms by using relative velocity method and instantaneous centre method.
	CO3.	Evaluate the basic parameters for Hooke's joint, straight-line motion and steering mechanisms.
	CO4.	Analyze the phenomenon of interference in gears and velocity ratio of gear trains.
	CO5.	Analyze the displacement diagrams and cam profile for different motions of the follower.
Fluid Mechanics & Hydraulic Machinery 20APC0314	CO1.	Understand the behaviour of fluids under static condition and one-dimensional flow of fluids.
	CO2.	Understand the behaviour of fluids under dynamic condition, conduit flow and fluid flow measurement
	CO3.	Analyze the velocity diagrams, hydro-dynamic forces of jets and hydro-electric power station
	CO4.	Evaluate the characteristics and performance of hydraulic turbines
	CO5.	Analyze the work done and performance characteristics of rotary and reciprocating pumps
ENTREPRENEURSHIP DEVELOPMENT 20AHSMB02	CO1.	Understand the concept and process of Entrepreneurship to develop entrepreneurial skills
	CO2.	Analyze the different feasibility studies to start a new enterprise.
	CO3.	Analyze the various sources of finance to entrepreneurs.
	CO4.	Analyze the role of central government and state government in promoting women Entrepreneurship.
	CO5.	Analyze the role of incubations in fostering startups.
Artificial Intelligence 20APE0521	CO1.	Understand the basic concepts of artificial intelligence and intelligent agents
	CO2.	Apply the searching techniques for solving searching problems.

	CO3.	Analyze the concepts of Reinforcement Learning and NLP Models.
	CO4.	Evaluate Natural Language Interfaces and perception mechanisms for Machines understanding.
	CO5.	Analyze the robotic designing modules and philosophy constraints for artificial intelligence.
SENSOR NETWORKS 20APE0417	CO1.	Understand the concepts of Converters and Sensor data acquisition systems
	CO2.	Understand the concepts of Sensor Measurements for Structural Monitoring
	CO3.	Analyze the commonly used sensing technologies and algorithms
	CO4.	Apply the piezoelectric transducers for assessing and monitoring infrastructures
	CO5.	Apply Fiber optic sensors for assessing and monitoring infrastructures
Renewable Energy Technologies 20APE0306	CO1.	Understand the necessity of different energy sources.
	CO2.	Apply the solar energy concepts for generation of electricity
	CO3.	Analyze the anaerobic digestion for bio-gas production and the wind energy for generation of electricity
	CO4.	Apply the ocean thermal energy conversion and geothermal energy conversion for generation of electricity
	CO5.	Analyze the properties of hydrogen as fuel, production and storage process of hydrogen energy
Introduction to CAD/CAM 20APE0302	CO1.	Understand the fundamentals of CAD, CAM, CIM, and Graphics technique in manufacturing
	CO2.	Apply the parametric and geometric representation of curves, surfaces and solids
	CO3.	Apply the NC, CNC, DNC part programming, and adaptive control for machining the components
	CO4.	Analyze the manufacturing strategies of group technology and production flow analysis in industries
	CO5.	Analyze the concepts of flexible manufacturing system, rapid prototyping and quality control in automated manufacturing systems
Nano Technology 20APE0303	CO1.	Understand the nano-science concepts and properties of nano-materials
	CO2.	Analyze the processing techniques to synthesis and fabricate nano-materials
	CO3.	Analyze the characterization techniques to study the morphological behaviour of nano-materials
	CO4.	Analyze the synthesis and characterization techniques of carbon-based materials.
	CO5.	Apply the nanotechnology concepts to real time applications in various fields
Fluid Mechanics & Hydraulic Machinery Lab 20APC0315	CO1.	Analyze the venturi-meter and orifice-meter to measure the discharge of flowing fluid.
	CO2.	Analyze the small orifice and external mouth piece setup to measure coefficient of discharge.
	CO3.	Apply the concepts of major and minor loss in pipes to measure coefficient of loss of head.
	CO4.	Apply the Bernoulli's concept and forces exerted by jet on vanes to measure discharge and total head.
	CO5.	Evaluate the performance of pelton wheel, Francis turbine and centrifugal pump.
Machine Tools – 1 Lab 20APC0319	CO1.	Analyze the turning and threading operations to develop simple components on lathe machine.
	CO2.	Analyze the tapper-turning methods on lathe machine to produce tapered products.

	CO3.	Apply the milling operations to produce groove and gear cutting on the specimen
	CO4.	Analyze the shaping operations to produce simple components like square and hexagonal nut
	CO5.	Apply the grinding techniques to obtain surface finish of the component.
SOFT SKILLS LAB 20ASA0502	CO1.	Understand the importance of verbal and non-verbal skills
	CO2.	Apply the interpersonal and intrapersonal skills
	CO3.	Apply the grammatical structures to formulate sentences and correct word forms.
	CO4.	Understand the trust among people and develop employability skills
	CO5.	Evaluate the skills needed for approaching different types of interviews.
PROFESSIONAL ETHICS AND HUMAN VALUES 20AMC9904	CO1.	Understand the sustained happiness through identifying the essentials of human values and skills.
	CO2.	Understand the importance of Values and Ethics in their personal lives and professional careers.
	CO3.	Understand the rights and responsibilities as an employee, team member and a global citizen.
	CO4.	Understand the importance of trust, mutually satisfying human behavior and enriching interaction with nature.
	CO5.	Understand appropriate technologies and management patterns to create harmony in professional and personal life.

III YEAR II SEM

Heat Transfer 20APC0317	CO1.	Apply the concepts of different modes of heat transfer to 1-D steady state composite systems.
	CO2.	Evaluate the steady state and unsteady state heat conduction problems applied to different geometries.
	CO3.	Evaluate the convective heat transfer rates under forced and free convection.
	CO4.	Analyze the concepts of heat transfer with phase change and condensation along with heat exchangers.
	CO5.	Analyze the concepts of black radiation and heat exchange between gray bodies.
Design of Machine Elements 20APC0316	CO1.	Apply the design procedures using theories of failure for different machine elements.
	CO2.	Evaluate the stresses induced in a machine element using Goodman's and Soderberg's criterions.
	CO3.	Apply the design procedures for riveted and bolted joints with direct and eccentric loadings.
	CO4.	Analyze the stresses in cotter and knuckle joints as well as design of shafts under bending and axial loads
	CO5.	Analyze the stresses in the design of keys, rigid and flexible couplings.
Dynamics of Machines 20APC0318	CO1.	Understand the concepts of friction on the mechanisms of clutches and brakes
	CO2.	Analyze the gyroscopic root map on moving vehicles and turning moment diagrams for engines.
	CO3.	Analyze the function of governors on engines as well as balancing of rotating masses.
	CO4.	Analyze the balancing of different types of engines working condition under reciprocating masses
	CO5.	Analyze the sensitive responses of vibrations in different methods.
Finite Element Analysis 20APE0308	CO1.	Understand the discrete and continuous models as well as basic concepts of Finite Element Methods

	CO2.	Apply the finite element formulations to solve one-dimensional second order problems.
	CO3.	Apply the finite element formulations to solve two-dimensional scalar variable problems.
	CO4.	Analyze the finite element methods to solve two-dimensional Vector variable problems.
	CO5.	Evaluate the isoparametric elements and dynamic problems using finite element method.
Applied Thermodynamics 20APE0304	CO1.	Analyze the testing process and performance of I.C engines and its combustion system
	CO2.	Analyze the working of reciprocating compressor and rotary compressor
	CO3.	Analyze the vapour power cycles and gas power cycles
	CO4.	Analyze the performance of different nozzles and working of various steam turbines
	CO5.	Analyze the working of VCR and VAR systems as well as psychrometry and air conditioning.
Composite Materials 20APE0305	CO1.	Apply the concepts of reinforcements and matrices to produce composites
	CO2.	Analyze the synthesis of fibers and fiber/matrix interface
	CO3.	Analyze the manufacturing techniques to fabricate polymer matrix composites
	CO4.	Analyze the processing methods to manufacture metal matrix composites
	CO5.	Analyze the production approaches to produce ceramic matrix composites and carbon-carbon composites
CAM LAB 20APC0328	CO1.	Analyze the static structural analysis of 2D and 3D structures using Finite Element Analysis.
	CO2.	Evaluate the stress and strains of beams under UDL and UVL conditions.
	CO3.	Analyze the steel bracket using plane stress condition by Finite Element Analysis
	CO4.	Analyze the pressure vessels on plane strain and axisymmetric condition
	CO5.	Analyze the curved shell due to internal pressure loading condition through FEA
Heat Transfer Lab 20APC0329	CO1.	Evaluate the overall heat transfer coefficient for composite walls.
	CO2.	Analyze the thermal conductivities of insulating powder, insulating material and metal rod as well as heat transfer in pin-fins.
	CO3.	Evaluate the heat transfer coefficients in forced and natural convection heat transfer.
	CO4.	Evaluate the overall heat transfer coefficient of parallel and counter flow heat exchangers using LMTD method.
	CO5.	Evaluate the surface emissivity and Stefan boltzman constant by comparing with the theoretical values.
Machine Tools – 2 Lab 20APC0330	CO1.	Analyze the drilling machine operations like drilling, counter boring, counter sinking, tapping and so on.
	CO2.	Apply the slotting operations to produce internal and external slots on the component.
	CO3.	Analyze the functioning of tool and cutter grinder to produce single point cutting tool.
	CO4.	Analyze the processes parameters of surface grinding machine to obtain surface finish of the product.
	CO5.	Apply the planning operations to produce plane surface of the specimen.

Crystal structure Analysis Lab 20ASC0303	CO1.	Analyze the microstructure of different steels through metallographic procedure under optical microscope
	CO2.	Analyze the microstructure of different aluminum alloys through metallographic procedure under optical microscope
	CO3.	Evaluate the average grain size for crystalline materials using line intercepts method.
	CO4.	Analyze the refined grain size of Al7075-T6 alloy after heat-treatment under optical microscope
	CO5.	Analyze the refined grain size of heat-treated steel under optical microscope
BIOLOGY FOR ENGINEERS 20AMC9901	CO1.	Understand the structure of cells and basics in living organisms
	CO2.	Understand the importance of various biomolecules and enzymes in living organisms
	CO3.	Analyze the functioning of physiology in respiratory system and digestive system.
	CO4.	Understand the DNA technology and gen cloning in living organisms.
	CO5.	Apply the biological principles in different technologies for the production of medicines and pharmaceuticals.
IV YEAR I SEM		
Alternative Fuels and Emission Control in Automotives (20APE0307)	CO1	Understand various alcohol and gaseous fuels and their use in SI and CI engines
	CO2	Analyze various vegetable oils and synthetic oils and their use in CI engines
	CO3	Analyze the formation of various emissions from SI engine and their control techniques
	CO4	Analyze the formation of various emissions from CI engine and their control techniques
	CO5	Analyze various emission measuring instruments and test procedures for different standards.
Refrigeration & Air Conditioning (20APE0311)	CO1	Apply the principles of VCR for heating and cooling in Refrigeration & Air conditioning
	CO2	Analyze the gas cycle refrigeration and environmental effects of CFC refrigerants
	CO3	Understand the working of various components of refrigeration system
	CO4	Analyze the Vapour Absorption Refrigeration systems and few other Refrigeration systems
	CO5	Evaluate the psychrometric properties based-on psychrometric charts for industrial air condition.
Computational Fluid Dynamics (20APE0309)	CO1	Analyze the applied numerical methods for solving algebraic equations using different methods.
	CO2	Analyze the conduction and convection problems using applications of Finite Difference Method.
	CO3	Analyze the hyperbolic and elliptic equations and fundamentals in fluid flow modeling.
	CO4	Analyze the flow physics and mathematical properties of governing Navier-Stokes equations.
	CO5	Apply the various techniques to solve fluid dynamics problems.
Digital Manufacturing and Industry 4.0 (20APE0310)	CO1	Understand the concepts of Digital Manufacturing and Industry 4.0 used in various industries.
	CO2	Analyze the process of additive manufacturing, virtual prototyping and reverse engineering.
	CO3	Apply the knowledge of digital manufacturing technologies on product life cycle and its management.

	CO4	Analyze the concepts of Industry 4.0 and allied technologies used in various industries.
	CO5	Apply the IoT techniques for smart manufacturing in various sectors of Industry.
Operations Research (20APC0323)	CO1	Apply the knowledge of operations research in solving linear programming problems.
	CO2	Apply the mathematical procedure for solving the transportation and assignment models related to real world problems.
	CO3	Evaluate the decisions to replace the items that deteriorate with time and to solve the game theory models.
	CO4	Analyze the available resources based on the priority in solving the sequencing problems.
	CO5	Analyze the simulation tools to develop the queuing and other relevant models.
Production and Operations Management (20APE0312)	CO1	Understand the operations and supply management to the sustainability of an enterprise.
	CO2	Analyze different forecasting methods to predict the business insights (like sales, production, inventory etc.).
	CO3	Apply the knowledge of facilities planning to various production and plant layouts.
	CO4	Analyze the quality control in the production management.
	CO5	Evaluate the production schedule for productivity.
Quality & Reliability Engineering (20APE0313)	CO1	Apply the total quality management (TQM) approaches in various sectors.
	CO2	Analyze the concepts of customer satisfaction and employee involvement strategies.
	CO3	Apply the appropriate tools and techniques of continuous process improvement for improving quality.
	CO4	Apply the Quality Function Deployment and Bench Marking process for improving a product or a process in industry.
	CO5	Evaluate the reliability of systems to improve the quality.
Power Plant Engineering (20APE0314)	CO1	Understand the concepts of different sources of energies and basics of power generation.
	CO2	Apply the economics of power generation and working of diesel engine power plant.
	CO3	Analyze the working of steam power plant to generate the power.
	CO4	Analyze the working of gas turbine power plant to produce power.
	CO5	Analyze the working of hydroelectric and nuclear power plants to generate energy.
Fuel cell Technologies (20APE0315)	CO1	Understand the fundamental concepts of different fuel cells.
	CO2	Analyze the fuel cells used in electrochemistry and their efficiency.
	CO3	Evaluate the fuel cells process design and operating conditions.
	CO4	Analyze the main components of solid-oxide fuel cells and advances in fuel cell technology.
	CO5	Analyze the different steps in fuel processing.
Electrical & Hybrid	CO1	Understand the basic principles of hybrid vehicles and its impact on environment.
	CO2	Analyze the concepts of drive-trains for hybrid and electric vehicle.

Vehicles (20APE0317)	CO3	Analyze the working components involved in electric propulsion unit.
	CO4	Analyze the energy storage units in hybrid and electric vehicles as well as matching the drive system of hybrid vehicle to IC engines.
	CO5	Analyze the energy management strategies used in hybrid and electric vehicles.
Automobile Engineering (20APE0301)	CO1	Understand the operation of engine components and working of cooling and lubrication systems.
	CO2	Apply the concept of fuel supply system to SI and CI engines of an automobile.
	CO3	Apply the knowledge of various ignition systems to SI engines.
	CO4	Analyze the working of various components in transmission systems.
	CO5	Apply the knowledge of suspension and braking systems to different kinds of engines.
IC Engines & Gas Turbines (20APE0316)	CO1	Evaluate the engine performance parameters for solving numerical problems in IC engines.
	CO2	Analyze the concepts of combustion process, carburetion, and emissions of engines.
	CO3	Analyze the engine electronics concepts to design the modern engines and concepts of supercharging.
	CO4	Evaluate the performance parameters of gas turbines.
	CO5	Analyze the working of jet propulsion engines and its parameters.
Air Pollution & Control (20APE0119)	CO1	Understand the fundamentals of air pollution and effects of air pollution.
	CO2	Understand the sources, types, lapse rate and decreasing measures of air pollution.
	CO3	Analyze the mechanisms of various particulate devices of pollution control.
	CO4	Apply the design principles of particulate and gaseous control.
	CO5	Analyze the causes and their effects of air pollution.
INTELLECTUAL PROPERTY RIGHTS (20AHSMB04)	CO1	Understand the fundamental concepts and importance of intellectual property rights.
	CO2	Understand the process of acquisition of trademark rights and registration process.
	CO3	Analyze the copyright principles and the law of patents.
	CO4	Understand the protection of Trade secrets for business.
	CO5	Understand the intellectual property laws at the international level.
GROUND IMPROVEMENT TECHNIQUES (20APE0117)	CO1	Understand the grouting techniques and their applications.
	CO2	Apply the densification methods in granular and cohesive soils.
	CO3	Apply the ground improvement methods to stabilize soil.
	CO4	Apply the reinforcement principles of earth wall.
	CO5	Apply the techniques for improvement of expansive soils and foundations.
	CO1	Understand the writing skills and level of readability.
	CO2	Apply the rules, principles for writing abstract and introduction part of research article.

Professional Communication (20AHE9903)	CO3	Apply the right methods to write the review of literature, results and conclusions.
	CO4	Apply the special skills for writing a title, abstract, review and introduction of literature.
	CO5	Apply the key skills for results in discussion and conclusion.
EFFECTIVE PUBLIC SPEAKING (20AHE9913)	CO1	Understand the communication skills effectively for professional success.
	CO2	Analyze the communication skills clearly and concisely in formal and informal conversations.
	CO3	Apply the information through drafting, editing and presentation.
	CO4	Apply the interpersonal skills in appropriate manner towards the growth of best career.
	CO5	Apply the sentence structures using correct vocabulary and without any grammatical errors.
Principles of Effective Public Speaking (20AHE9902)	CO1	Apply the knowledge of principles, concepts and skills in speech preparation.
	CO2	Understand the listening skills and styles in effective listening and speech techniques.
	CO3	Analyze the techniques of knowing audience and refining the speech.
	CO4	Apply the guidelines and efficient organizational skills in speech composition.
	CO5	Apply the supporting materials and presentation aids in speech preparation.
IV YEAR II SEM		
Project work (20APR0301)	CO1	Apply the mechanical engineering concepts (both theoretical and practical) to design and develop innovative project useful to the society.
	CO2	Analyze the complex engineering problems, identify feasible solutions and implement the best possible approach using modern engineering tools and techniques.
	CO3	Create an effective plan, manage and execute project activities, ensuring adherence to timelines, resource constraints and project specifications.
	CO4	Create the strong communication skills to do project reports in-detail and to deliver concise presentation.
	CO5	Create the sustainable and eco-friendly engineering solutions and follow the ethical standards to deploy the project.