



ESHAN COLLEGE OF ENGINEERING

(Approved by AICTE, New Delhi, Affiliated to Dr. A.P.J Abdul Kalam Technical University, Lucknow)
Sahzadpur Pauri, NH-2, Agra-Mathura Highway, Mathura-281122, Uttar Pradesh
Website: www.eshancollege.com

Department of Mechanical Engineering (ME)



Programme: B.Tech. Mechanical Engineering

Course Outcomes (COs)

2nd Year (3rd Semester)

Course Code	Course Name	<u>Course Outcomes (COs)</u>	
		<i>At the completion of the course, students will be able to:</i>	
KOE034/ KOE044	Sensor and Instrumentation	CO1	Apply the use of sensors for measurement of displacement, force and pressure.
		CO2	Employ commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level.
		CO3	Demonstrate the use of virtual instrumentation in automation industries.
		CO4	Identify and use data acquisition methods.
		CO5	Comprehend intelligent instrumentation in industrial automation.
KOE035/ KOE045	Basics Data Structure and	CO1	Understand and analyze the time and space complexity of an algorithm



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	Algorithms	CO2	Understand and implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming)
		CO3	Discuss various algorithm design techniques for developing algorithms
		CO4	Discuss various searching, sorting and graph traversal algorithms
		CO5	Understand operation on Queue, Priority Queue, D-Queue.
KOE036/ KOE046	Introduction to Soft Computing	CO1	Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory
		CO2	Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
		CO3	Describe with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.
		CO4	Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.
		CO5	Develop some familiarity with current research problems and research methods in Soft Computing Techniques
KOE037/ KOE047	Analog Electronics Circuits	CO1	Understand the characteristics of diodes and transistors.
		CO2	Design and analyze various rectifier and amplifier circuits.
		CO3	Design sinusoidal and non-sinusoidal oscillators
		CO4	Understand the functioning of OP-AMP and design OP-AMP based circuits
		CO5	Design LPF, HPF, BPF, BSF.
KOE038/ KOE048	Electronics Engineering	CO1	Understand the concept of PN junction and special purpose diodes.
		CO2	Study the application of conventional diode and semiconductor diode.
		CO3	Analyze the I-V characteristics of BJT and FET.
		CO4	Analyze the of Op-Amp, amplifiers, integrator, and differentiator.
		CO5	Understand the concept of digital storage oscilloscope and compare of DSO with analog oscilloscope
KAS302	Maths-IV	CO1	Remember the concept of partial differential equation and to solve partial differential equations
		CO2	Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations
		CO3	Understand the concept of correlation, moments, skewness and kurtosis and curve fitting
		CO4	Remember the concept of probability to evaluate probability distributions
		CO5	Apply the concept of hypothesis testing and statistical quality control to create control charts
KAS301	Technical Communication	CO1	Understand the nature and objective of Technical Communication relevant for the work place as Engineers



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		CO2	Utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions
		CO3	Have good presentation skills to enhance confidence in face of diverse audience
		CO4	Have a vast know-how of the application of the learning to promote their technical competence
		CO5	Evaluate his/her efficacy as fluent & efficient communicators by learning the voice-dynamics
KVE301	Universal Human Values and Professional Ethics	CO1	Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
		CO2	Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
		CO3	Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
		CO4	Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
		CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
KME301	Thermodynamics	CO1	Apply energy balance to systems and control volumes, in situations involving heat and work interactions.
		CO2	Evaluate changes in thermodynamic properties of substances.
		CO3	Evaluate the performance of energy conversion devices.
		CO4	Differentiate between high grade and low-grade energies.
		CO5	Understand the difference between high grade and low-grade energies and II law limitations on energy conversion.
KME302	Fluid Mechanics and Fluid Machines	CO1	Learn about the application of mass and momentum conservation laws for fluid flows.
		CO2	Understand the concept of dimensional analysis
		CO3	Obtain the velocity and pressure variations in various types of simple flows.
		CO4	Mathematically analyze simple flow situations.
		CO5	Evaluate the performance of pumps and turbines.
KME303	Materials Engineering	CO1	Identify crystal structures for various materials and understand the defects in such structures.
		CO2	Understand how to tailor material properties of ferrous and non-ferrous alloys.
		CO3	How to quantify mechanical integrity and failure in materials.
		CO4	Understand correlation between the internal structure of materials, their mechanical properties and various methods to quantify their mechanical integrity and failure criteria.
		CO5	Got a detailed interpretation of equilibrium phase diagrams.
KME351	Fluid Mechanics	CO1	Measure various properties off fluids.



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	Lab	CO2	Understand the principles and performance characteristics of flow and thermal devices
		CO3	Verify the Bernoulli's Theorem
		CO4	To characterize the performance of fluid/thermal machinery.
		CO5	To show the velocity and pressure variation with radius in a forced vertex flow.
KME352	Material Testing Lab	CO1	Understand the principles and performance characteristics different materials.
		CO2	Measure various properties of materials.
		CO3	Draw stress versus strain plot for materials.
		CO4	Find Hardness of materials using different testing methods
		CO5	Study different nondestructive testing methods
KME353	Computer Aided Machine Drawing-I Lab	CO1	Can use computer and CAD software for modeling mechanical components
		CO2	Get an overview of how computers can be utilized in mechanical component design
		CO3	Understand free hand sketching of foundation bolts, studs, pulleys, couplings
		CO4	Understand assembly drawings
		CO5	Understand orthographic projection during drawings of machine elements
KME354	Mini Project or Internship Assessment	CO1	Understand and apply the knowledge of the industry in which the internship is done
		CO2	Remember and apply the knowledge and skills learned in the classroom in a work setting
		CO3	Understand and analyse the activities and functions of business professionals
		CO4	Understand and evaluate the areas for future knowledge and skill development
		CO5	Analyse and develop a greater understanding about career options while more clearly defining personal career goals
KNC301	Computer System Security	CO1	Discover software bugs that pose cyber security threats and to explain how to fix the bugs to mitigate such threats
		CO2	Discover cyber-attack scenarios to web browsers and web servers and to explain how to mitigate such threats
		CO3	Discover and explain mobile software bugs posing cyber security threats, explain and recreate exploits, and to explain mitigation techniques.
		CO4	Articulate the urgent need for cyber security in critical computer systems, networks, and world wide web, and to explain various threat scenarios
		CO5	Articulate the well-known cyber-attack incidents, explain the attack scenarios, and explain mitigation techniques.
KNC302	Python Programming	CO1	Read and write simple Python programs
		CO2	Develop Python programs with conditionals and loops
		CO3	Define Python functions and to use Python data structures - lists, tuples, dictionaries
		CO4	Do input/output with files in Python
		CO5	Do searching, sorting and merging in Python



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2nd Year (4th Semester)

Course Code	Course Name	<u>Course Outcomes (COs)</u>	
		<i>At the completion of the course, students will be able to:</i>	
KAS402	Maths-IV	CO1	Remember the concept of partial differential equation and to solve partial differential equations
		CO2	Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations
		CO3	Understand the concept of correlation, moments, skewness and kurtosis and curve fitting
		CO4	Remember the concept of probability to evaluate probability distributions
		CO5	Apply the concept of hypothesis testing and statistical quality control to create control charts
KVE401	Universal Human Values and Professional Ethics	CO1	Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
		CO2	Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
		CO3	Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
		CO4	Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
		CO5	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.
KAS401	Technical Communication	CO1	Understand the nature and objective of Technical Communication relevant for the work place as Engineers.
		CO2	Utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions
		CO3	Imbibe inputs by presentation skills to enhance confidence in face of diverse audience
		CO4	Have a vast know-how of the application of the learning to promote their technical competence
		CO5	Evaluate his/her efficacy as fluent & efficient communicators by learning the voice-dynamics.
KME401	Applied Thermodynamics	CO1	Get a good understanding of various practical power cycles and heat pump cycles



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		CO2	Analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors.
		CO3	Understand phenomena occurring in high-speed compressible flows.
		CO4	Learn about gas dynamics of air flow and steam through nozzles.
		CO5	Analyze the performance of steam turbines.
KME402	Engineering Mechanics	CO1	Understand the various effects of force and motion on the engineering design structures
		CO2	Understand two-dimensional force systems
		CO3	Understand about Centroid and moment of inertia
		CO4	Understand Kinematics and kinetics of rigid body
		CO5	Understand pure bending of beams.
KME403	Manufacturing Processes	CO1	Understand different conventional and unconventional manufacturing methods employed for making different products.
		CO2	Understand about single & multi-point cutting, and different type of cutting tools & their materials.
		CO3	Understand about orthogonal cutting.
		CO4	Understand about grinding and super finishing processes.
		CO5	Understand about metal joining processes.
KME451	Applied Thermodynamics Lab	CO1	Identify various properties of a system.
		CO2	Understand the principles and performance of various boilers.
		CO3	Understand the principles and performance of various engines.
		CO4	Study the Impulse & Reaction turbine.
		CO5	Study the Gas Turbine Model.
KME452	Manufacturing Process Lab	CO1	Understand the different conventional and unconventional manufacturing methods employed for making different products.
		CO2	Understanding limits, fits & tolerances
		CO3	Understand different types of tools and its angles & materials
		CO4	Understanding tool wear and tool life
		CO5	Understand the displacement using LVDT
KME453	Computer Aided Machine Drawing-II Lab	CO1	Use computers and CAD software modelling in mechanical component design
		CO2	Understand the details of bill of materials (BOM)
		CO3	Understand about Conventional representation of machine components with software
		CO4	Understand part modelling of simple machine components using any 3D software
		CO5	Understand part assembling using software
KNC402	Python Programming	CO1	Read and write simple Python programs
		CO2	Develop Python programs with conditionals and loops.
		CO3	Define Python functions and to use Python data structures — lists, tuples, dictionaries
		CO4	Do input/output with files in Python
		CO5	Do searching, sorting and merging in Python



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KNC401	Computer System Security	CO1	Discover software bugs that pose cyber security threats and to explain how to fix the bugs to mitigate such threats
		CO2	Discover cyber-attack scenarios to web browsers and web servers and to explain how to mitigate such threats
		CO3	Discover and explain mobile software bugs posing cyber security threats, explain and recreate exploits, and to explain mitigation techniques.
		CO4	Articulate the urgent need for cyber security in critical computer systems, networks, and world wide web, and to explain various threat scenarios
		CO5	Articulate the well-known cyber-attack incidents, explain the attack scenarios, and explain mitigation techniques.

3rd Year (5th Semester)

Course Code	Course Name	<u>Course Outcomes (COs)</u>	
		<i>At the completion of the course, students will be able to:</i>	
KME501	Heat and Mass Transfer	CO1	Understand the fundamentals of heat and mass transfer.
		CO2	Apply the concept of steady and transient heat conduction.
		CO3	Apply the concept of thermal behavior of fins.
		CO4	Apply the concept of forced and free convection
		CO5	Apply the concept of radiation for black and non-black bodies.
KME502	Strength of Material	CO1	Understand the concept of stress and strain under different conditions of loading
		CO2	Determine the principal stresses and strains in structural members
		CO3	Determine the stresses and strains in the members subjected to axial, bending and torsional loads
		CO4	Apply the concepts of stresses and strain in solving problems related to springs, column and pressure vessels
		CO5	Calculate the slope, deflection and buckling of loaded members
KME503	Industrial Engineering	CO1	Understand the concept of production system, productivity, facility and process planning in various industries
		CO2	Apply the various forecasting and project management techniques
		CO3	Apply the concept of break-even analysis, inventory control and resource utilization using queuing theory
		CO4	Apply principles of work study and ergonomics for design of work systems
		CO5	Formulate mathematical models for optimal solution of industrial problems using linear programming approach
KME551	Heat and Mass Transfer Lab	CO1	Apply the concept of conductive heat transfer.
		CO2	Apply empirical correlations for both forced and free convection to determine the value of convection heat transfer coefficient



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		CO3	Apply the concept of radiation heat transfer for black and grey body.
		CO4	Analyze the thermal behavior of parallel or counter flow heat exchangers
		CO5	Conduct thermal analysis of a heat pipe
KME552	Python Lab	CO1	Apply conditional statement, loops condition and functions in python program
		CO2	Solve mathematical and mechanical problems using python program
		CO3	Plot various type of chart using python program
		CO4	Analyze the mechanical problem using python program
		CO5	Write python programs to determine properties of mechanical elements
KME553	Internet of Things Lab	CO1	Understand Internet of Things and its hardware and software components
		CO2	Interface I/O devices, sensors & communication modules
		CO3	Remotely monitor data and control devices
		CO4	Design prototype of IoT based smart system
		CO5	Develop IoT based projects for real life problem.
KME051	Computer Integrated Manufacturing	CO1	Understand the basic concepts of automation, computer numeric control machining
		CO2	Understand the algorithms of line generation, circle generation, transformation, curve, surface modeling and solid modeling
		CO3	Understand group technology, computer aided process planning, flexible manufacturing, Industry 4.0, robotics
		CO4	Understand information system and material handling in CIM environment, rapid prototyping
		CO5	Apply the algorithms of line & circle generation and geometric transformations
KME052	Mechatronics Systems	CO1	Identify key elements of mechatronics and its representation by block diagram
		CO2	Understand the concept of sensors and use of interfacing systems.
		CO3	Understand the concept and applications of different actuators
		CO4	Illustrate various applications of mechatronic systems
		CO5	Develop PLC ladder programming and implementation in real life problem.
KME053	Finite Element Methods	CO1	Understand the basic concepts of FEM and its applications.
		CO2	Apply the procedure involved to solve a problem using Finite Element Methods
		CO3	Develop the element stiffness matrices using different approach.
		CO4	Analyze 1D and 2D problem using different methods
		CO5	Analyze the complex geometric problems through FEM software packages.
KME054	I C Engine, Fuel and Lubrication	CO1	Explain the working principle, performance parameters and testing of IC Engine.
		CO2	Understand the combustion phenomena in SI and CI engines and factors influencing combustion chamber design.



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		CO3	Understand the essential systems of IC engine and latest trends and developments in IC Engines.
		CO4	Understand the effect of engine emissions on environment and human health and methods of reducing it.
		CO5	Apply the concepts of thermodynamics to air standard cycle in IC Engines
KAU051	Automobile Engines & Combustion	CO1	Explain the working principle, performance parameters and testing of IC Engine.
		CO2	Understand the phenomena of combustion and its application in SI and CI engines.
		CO3	Understand the essential systems of IC engine.
		CO4	Understand the effect of engine emissions on environment and human health and methods of reducing it.
		CO5	Analyze the effect of various operating parameters on IC engine performance.
KME055	Advance Welding	CO1	Understand the physics of arc welding process and various operating characteristics of welding power source.
		CO2	Analyze various welding processes and their applications.
		CO3	Apply the knowledge of welding for repair & maintenance, along with the weldability of different materials.
		CO4	Apply the concept of quality control and testing of weldments in industrial environment.
		CO5	Evaluate heat flow in welding and physical metallurgy of weldments.
KME056	Programming, Data Structures and Algorithms Using Python	CO1	Understand the numbers, math's function, strings, list, tuples, and dictionaries in pythons
		CO2	Apply conditional statement and functions in python
		CO3	Apply file handling techniques in python
		CO4	Analyze the graphical demonstration in python
		CO5	Apply techniques of Classes and Object Concept in Python
KME057	Mechanical Vibrations	CO1	Understand fundamentals of mechanical vibrations along with their classification
		CO2	Differentiate among single, two and multiple degree of freedom (DOF) systems.
		CO3	Analyze, predict and measure the performance of systems undergoing single, two and multiple DOF.
		CO4	Design systems with optimized vibration absorption capabilities.
		CO5	Solve complicated mathematical models using Numerical methods and software applications.
KME058	Fuels and Combustion	CO1	Understand the properties of different types of fuel with their application
		CO2	Classify different types of fuels.
		CO3	Understand the concept of combustion.
		CO4	Understand the fundamental concept of air pollution and its control.
		CO5	Calculate various properties of the fuels.
KAU052	Automotive Chassis and	CO1	Understand different types of automotive chassis and frames used in automobiles.



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	Suspension	CO2	Understand transmission and drive line components used in automobile.
		CO3	Understand the axles and types of steering system in automobile.
		CO4	Understand the constructional features of barking, suspension system, wheels and tyres in automobile application.
		CO5	Understand the recent advancements made in chassis components of automobile.
KME554	Mini Project or Internship Assessment	CO1	Understand and apply the knowledge of the industry in which the internship is done
		CO2	Remember and apply the knowledge and skills learned in the classroom in a work setting
		CO3	Understand and analyse the activities and functions of business professionals
		CO4	Understand and evaluate the areas for future knowledge and skill development
		CO5	Analyse and develop a greater understanding about career options while more clearly defining personal career goals
KNC501	Constitution of India, Law and Engineering	CO1	Identify and explore the basic features and modalities about Indian constitution.
		CO2	Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
		CO3	Differentiate different aspects of Indian Legal System and its related bodies.
		CO4	Discover and apply different laws and regulations related to engineering practices.
		CO5	Correlate role of engineers with different organizations and governance models.
KNC502	Indian Tradition, Culture and Society	CO1	Ability to understand, connect up with others.
		CO2	Explain basics of Indian Traditional knowledge in modern scientific perspectives.
		CO3	Have basic principles of thought process, reasoning and inference to identify the roots and details of some of the contemporary issues faced by our nation.
		CO4	Understanding about the importance of our surroundings and encourage others to contribute towards sustainable development.
		CO5	Aware about holistic life styles of Yogic-science and wisdom capsules in Sanskrit literature that are important in modern society with rapid technological advancements and societal disruptions.



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3rd Year (6th Semester)

Course Code	Course Name	<u>Course Outcomes (COs)</u>	
<i>At the completion of the course, students will be able to:</i>			
KME601	Refrigeration & Air Conditioning	CO1	Understand the basic concepts of Refrigeration & Air-Conditioning and its future prospects.
		CO2	Explain the construction and working of various components in Refrigeration & Air-Conditioning systems.
		CO3	Understand the different types of RAC systems with their respective applications.
		CO4	Apply the basic laws to the thermodynamic analysis of different processes involved in Refrigeration and Air-Conditioning.
		CO5	Apply the basic concepts to calculate the COP and other performance parameters for different RAC systems
KME602	Machine Design	CO1	Recall the basic concepts of Solid Mechanics to understand the subject.
		CO2	Classify various machine elements based on their functions and applications.
		CO3	Apply the principles of solid mechanics to machine elements subjected to static and fluctuating loads.
		CO4	Analyze forces, bending moments, twisting moments and failure causes in various machine elements to be designed.
		CO5	Design the machine elements to meet the required specification.
KME603	Theory of Machines	CO1	Understand the principles of kinematics and dynamics of machines.
		CO2	Calculate the velocity and acceleration for 4-bar and slider crank mechanism
		CO3	Develop cam profile for followers executing various types of motions
		CO4	Apply the concept of gear, gear train and flywheel for power transmission
		CO5	Apply dynamic force analysis for slider crank mechanism and balance rotating & reciprocating masses in machines.
KME651	Refrigeration & Air Conditioning Lab	CO1	Determine the performance of different refrigeration and air-conditioning systems
		CO2	Apply the concept of psychrometry on different air-cooling systems.
		CO3	Interpret the use of different components, control systems and tools used in RAC systems
		CO4	Demonstrate the working of practical applications of RAC systems.
		CO5	Understand ice-plant and calculation of various performance parameters



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KME652	Machine Design Lab	CO1	Apply the principles of solid mechanics to design various machine Elements subjected to static and fluctuating loads.
		CO2	Write computer programs and validate it for the design of different machine elements
		CO3	Analyze forces, bending moments, twisting moments and failure causes in various machine elements to be designed.
		CO4	Design the machine elements to meet the required specification.
		CO5	Evaluate designed machine elements to check their safety.
KME653	Theory of Machines Lab	CO1	Demonstrate various mechanisms, their inversions and brake and clutches in automobiles
		CO2	Apply cam-follower mechanism to get desired motion of follower.
		CO3	Apply the concepts of gears and gear train to get desired velocity ratio for power transmission.
		CO4	Apply the concept of governors to control the fuel supply in engine.
		CO5	Determine the balancing load in static and dynamic balancing problem
KME061	Nondestructive Testing	CO1	Understand the concept of destructive and Non-destructive testing methods.
		CO2	Explain the working principle and application of die penetrant test and magnetic particle inspection.
		CO3	Understand the working principle of eddy current inspection.
		CO4	Apply radiographic techniques for testing.
		CO5	Apply the principle of Ultrasonic testing and applications in medical and engineering areas.
KME062	Artificial Intelligence	CO1	Understand concepts of Artificial Intelligence
		CO2	Solve problem by Search-I & Search-II
		CO3	Understand Knowledge representation
		CO4	Apply concepts of Learning methods
		CO5	Analyze Decision Networks
KME063	Tribology	CO1	Identify and explain various friction and wear mechanisms
		CO2	Select proper lubricants for different applications.
		CO3	Select suitable lubrication methods in different bearings.
		CO4	Study the surfaces coating techniques for reduction of wear.
		CO5	Analyze the impact of friction in various kinematic pairs.
KME064	Gas Dynamics and Jet Propulsion	CO1	Understand the concept of compressible fluid flow and flow through variable area ducts.
		CO2	Understand the basic principle and types of jet and rocket propulsion.
		CO3	Apply the basic laws for the investigation of flow through ducts.
		CO4	Apply the basic laws for the thermodynamics analysis of jet and rocket propulsion.
		CO5	Analyze the compressible flow through variable area ducts.
KAU061	Automotive Electrical and	CO1	Understand the basic concepts of electrical systems used in automobile.



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	Electronics	CO2	Understand the constructional features of charge storage devices and methods to test these devices for their healthy operation.
		CO3	Understand the principles and characteristics of charging and starting system of automobile and study the various faults occurring in system.
		CO4	Understand the ignition and auxiliary system- types & constructional features used in automobile.
		CO5	Describe the principles and architecture of electronics systems and its components present in an automobile related to data transfer, instrumentation, control, and security systems.
KOE060	Idea to Business Model	CO1	Have creative knowledge regarding selection of a business idea and its implementation process.
		CO2	Acquire knowledge on entrepreneurship development, its Pro's and con's.
		CO3	Acquire basic knowledge on how to become an entrepreneur.
		CO4	Have deep knowledge on Production systems and its sustainability through production, planning and control (PPC).
		CO5	Have appropriate business model and knowledge to apply in a better way.
KOE061	Real Time Systems	CO1	Describe concepts of Real-Time systems and modeling
		CO2	Recognize the characteristics of a real-time system in context with real time scheduling.
		CO3	Classify various resource sharing mechanisms and their related protocols.
		CO4	Interpret the basics of real time communication by the knowledge of real time models and protocols.
		CO5	Apply the basics of RTOS in interpretation of real time systems.
KOE062	Embedded System	CO1	Understand the basics of embedded system and its structural units.
		CO2	Analyze the embedded system specification and develop software programs.
		CO3	Evaluate the requirements of the programming embedded systems, related software architecture
		CO4	Understand the RTOS based embedded system design.
		CO5	Understand all the applications of the embedded system and designing issues.
KOE063	Introduction to MEMS	CO1	Understand the Basic concept of MEMS Fabrication Technologies, Piezo resistance Effect, Piezoelectricity, Piezoresistive Sensor.
		CO2	Explain Mechanics of Beam and Diaphragm Structures.
		CO3	Understand the Basic concept of Air Damping and Basic Equations for Slide-film Air Damping, Couette-flow Model, Stokes-flow Model.
		CO4	Know the concept of Electrostatic Actuation.
		CO5	Understand the applications of MEMS in RF.
KOE064	Object Oriented Programming	CO1	Understand the Basic concept of Object Orientation, object identity and Encapsulation.



ESHAN COLLEGE OF ENGINEERING

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		CO2	Understand the Basic concept of Basic Structural Modeling
		CO3	Know the knowledge of Object-oriented design, Object design.
		CO4	Know the knowledge of C++ Basics.
		CO5	Understand the Basics of object and class in C++.
KOE065	Computer based Numerical Techniques	CO1	Understand the concept of errors to evaluate approximate roots of several types of equations.
		CO2	Analyze the problem and evaluate data by different interpolation methods and creating interpolating graphs.
		CO3	Understand the concept of interpolation to analyze and evaluate the numerical differentiation and integration.
		CO4	Remember the concept of formula based the solution of ordinary differential equations to evaluate differential equations withy initial conditions.
		CO5	Apply the concept of partial differential equation to evaluate the partial differential equations.
KOE066	GIS & Remote Sensing	CO1	Understand about the principles of Remote Sensing and its advantages and limitations.
		CO2	Retrieve the information content of remotely sensed data
		CO3	Apply problem specific remote sensing data for engineering applications.
		CO4	Analyze spatial and attribute data for solving spatial problems.
		CO5	Create GIS and cartographic outputs for presentation
KOE067	Basics of Data Base Management System	CO1	Describe the features of a database system and its application and compare various types of data models.
		CO2	Construct an ER Model for a given problem and transform it into a relation database schema.
		CO3	Formulate solution to a query problem using SQL Commands, relational algebra, tuple calculus and domain calculus.
		CO4	Explain the need of normalization and normalize a given relation to the desired normal form.
		CO5	Explain different approaches of transaction processing and concurrency control.
KOE068	Software Project Management	CO1	Identify project planning objectives, along with various cost/effort estimation models.
		CO2	Organize & schedule project activities to compute critical path for risk analysis
		CO3	Monitor and control project activities.
		CO4	Formulate testing objectives and test plan to ensure good software quality under SEI-CMM.
		CO5	Configure changes and manage risks using project management tools.
KOE069	Understanding Human Being, Nature and Existence Comprehensively	CO1	Have clarity about human aspirations, goal, activities and purpose of life.
		CO2	Understand the harmony in nature/ existence and participation of human being in the nature/existence.
		CO3	Have understanding of human tradition and its various components
		CO4	Understand about the need and the process of inner evolution (Co-existence with other orders)



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		CO5	Know about ‘expansion of harmony from self to entire existence’
KNC601	Constitution of India, Law and Engineering	CO1	Identify and explore the basic features and modalities about Indian constitution.
		CO2	Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
		CO3	Differentiate different aspects of Indian Legal System and its related bodies
		CO4	Discover and apply different laws and regulations related to engineering practices
		CO5	Correlate role of engineers with different organizations and governance models
KNC602	Indian Traditions, Cultural and Society	CO1	Ability to understand, connect up with others.
		CO2	Explain basics of Indian Traditional knowledge in modern scientific perspectives.
		CO3	Have basic principles of thought process, reasoning and inference to identify the roots and details of some of the contemporary issues faced by our nation.
		CO4	Understanding about the importance of our surroundings and encourage others to contribute towards sustainable development.
		CO5	Aware about holistic life styles of Yogic-science and wisdom capsules in Sanskrit literature that are important in modern society with rapid technological advancements and societal disruptions.

4th Year (7th Semester)

Course Code	Course Name	<u>Course Outcomes (COs)</u>	
		<i>At the completion of the course, students will be able to:</i>	
KHU701	Rural Development: Administration and Planning	CO1	Understand the definitions, concepts and components of Rural Development
		CO2	Know the importance, structure, significance, resources of Indian rural economy
		CO3	Have a clear idea about the area development programmes and its impact.
		CO4	Acquire knowledge about rural entrepreneurship
		CO5	Understand about the using of different methods for human resource planning
KHU702	Project Management & Entrepreneurship	CO1	Understand need, scope, entrepreneurial competencies & traits
		CO2	Entrepreneurial idea and innovation
		CO3	Understand project appraisal: Preparation of a real time project feasibility report containing technical appraisal
		CO4	Understand project financing
		CO5	Understand social entrepreneurship



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KME071	Additive Manufacturing	CO1	Understanding the basics of additive manufacturing/rapid prototyping and its advantages and disadvantages
		CO2	Understanding the role of additive manufacturing in the design process and the implications for design.
		CO3	Understanding the processes used in additive manufacturing for a range of materials and applications
		CO4	Understand the various software tools, processes and techniques that enable advanced/additive manufacturing and personal fabrication.
		CO5	Apply knowledge of additive manufacturing for various real-life applications
KME072	HVAC Systems	CO1	Understand the basics concepts of HVAC and various HVAC systems.
		CO2	Understand the use of refrigerants with their respective applications and its future trends
		CO3	Understand the use of different auxiliary systems used in HVAC systems
		CO4	Apply the basic laws for thermodynamic analysis of different processes involved in HVAC systems
		CO5	Apply the basic concepts to calculate the HVAC loads for different applications.
KAU072	Hybrid Vehicle Propulsion	CO1	Understand the basics of the hybrid electric vehicles and its types.
		CO2	Understand the types of drive trains used in hybrid vehicles
		CO3	Understand the propulsion units used in Hybrid Vehicles and their efficiency.
		CO4	Understand the requirements and devices of energy storage used in hybrid vehicles
		CO5	Understand the concept of downsizing of IC engines in case of hybrid vehicles.
KME073	Mathematical Modeling of Manufacturing Processes	CO1	Understand the fundamentals of manufacturing processes, mathematical models and their solutions
		CO2	Understand unconventional and conventional machining, their discrete-time linear, non-linear models and solutions
		CO3	Analyze the mechanism of forming and heat transfer in welding
		CO4	Apply the principles of casting, powder metallurgy, coating and additive Manufacturing
		CO5	Understand the fundamental of heat treatment, micro / nano manufacturing and processing of non-metallic materials.
KME074	Machine Learning	CO1	Understand the need of machine learning concepts
		CO2	To Understand a wide variety of ML Algorithms and how to evaluate models generated from data
		CO3	Solve prediction-based problems
		CO4	Analyze machine learning algorithms
		CO5	Apply the Algorithms to real-world problems
KME075	Computer Graphics and Product	CO1	Understand the components of a computer graphics with object representation and to develop algorithm for graphics system components



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	Modeling	CO2	Understand the basic principles of 3- dimensional computer graphics and express the 3D model with illumination and shading effects.
		CO3	Develop a 3D solid model using 3D Solid Modeling Software
		CO4	Identify the customer needs in order to develop a business model for new product.
		CO5	Develop strategy for designing and development of a new product
KME076	Power Plant Engineering	CO1	Understand the different sources of power generation and their impact on environment
		CO2	Understand the elements of power generation using conventional and nonconventional energy sources
		CO3	Understand the concepts of electrical systems used in power plants
		CO4	Apply the basic concepts of thermodynamics to measure the performance of different power plants
		CO5	Determine the performance of power plants based on load variations
KAU073	Vehicle Body Engineering & Safety	CO1	Understand the classification of the vehicles on the basis of body.
		CO2	Understand the importance of material selection in designing automotive bodies.
		CO3	Understand the concepts of aerodynamics used in designing automobiles.
		CO4	Understand the importance of interior and exterior ergonomics while designing the vehicle.
		CO5	Identify various sources of noise and methods of noise separation and various safety aspects in a given vehicle.
KME751	Measurement & Metrology Lab	CO1	Understand the basic principles of instrumentation for measurement of surface finish, strain, temperature, pressure and flow. .
		CO2	Understand the principle and operation of Coordinate Measuring Machine (CMM).
		CO3	Apply Sine Bar, Slip Gauges, Bevel Protractor, Stroboscope, Dial Indicator etc. for measurement of different attributes.
		CO4	Apply the basic concepts of limits, fits & tolerances for selective assembly.
		CO5	Understand limit gauges
KME752	Mini Project or Internship Assessment	CO1	Developing a technical artifact requiring new technical skills and effectively utilizing a new software tool to complete a task
		CO2	Writing requirements documentation, selecting appropriate technologies, identifying and creating appropriate test cases for systems
		CO3	Demonstrating understanding of professional customs & practices and working with professional standards
		CO4	Improving problem-solving, critical thinking skills and report writing



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		CO5	Learning professional skills like exercising leadership, behaving professionally, behaving ethically, listening effectively, participating as a member of a team, developing appropriate workplace attitudes
KME753	Project	CO1	Demonstrate a sound technical knowledge of their selected project topic
		CO2	Identification of problem, interpretation and solution
		CO3	Formulate engineering solutions to complex problems utilizing a systems approach
		CO4	Design and develop an engineering project and communicate with engineers and the community at large in written and oral form
		CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer

4th Year (Open Electives II List)

Course Code	Course Name	<u>Course Outcomes (COs)</u>	
		<i>At the completion of the course, students will be able to:</i>	
KOE071	Filter Design	CO1	Choose an appropriate transform for the given signal.
		CO2	Choose appropriate decimation and interpolation factors for high performance filters.
		CO3	Model and design an AR system
		CO4	Implement filter algorithms on a given DSP processor platform.
		CO5	Understand the concept of Approximation Theory.
KOE072	Bioeconomics	CO1	Understand basic concept of Bioeconomics, challenges, opportunities & regulations
		CO2	Understand development and innovation in terms of bioeconomy towards sustainable development
		CO3	Understand Inter- and trans disciplinary in bioeconomy & research approaches
		CO4	Explain biobased resources, value chain, innovative use of biomass and biological knowledge to provide food, feed, industrial products
		CO5	Know importance of bioeconomy related concepts in public, scientific, and political discourse
KOE073	Machine Learning	CO1	Understand the need for machine learning for various problem solving
		CO2	Understand a wide variety of learning algorithms and how to evaluate models generated from data
		CO3	Understand the latest trends in machine learning
		CO4	Design appropriate machine learning algorithms and apply the algorithms to a real-world problems
		CO5	Optimize the models learned and report on the expected accuracy that can be achieved by applying the models



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KOE074	Renewable Energy Resources	CO1	Understand various non-conventional energy resources
		CO2	Understand solar thermal energy, its' storage for solar heating and cooling
		CO3	Understand Geothermal Energy, its resources & use
		CO4	Details of Thermo-electrical and thermionic Conversions, wind energy
		CO5	Understand Bio-mass, its availability and conversion, ocean thermal energy conversion
KOE077	Design Thinking	CO1	Develop a strong understanding of the design process and apply it in a variety of business settings
		CO2	Analyze self, culture, teamwork to work in a multidisciplinary environment and exhibit empathetic behavior
		CO3	Formulate specific problem statements of real time issues and generate innovative ideas using design tools
		CO4	Apply critical thinking skills in order to arrive at the root cause from a set of likely causes
		CO5	Demonstrate an enhanced ability to apply design thinking skills for evaluation of claims and arguments
KOE078	Soil and Water Conservation Engineering	CO1	Know about soil conservation and its scope
		CO2	Understand types of soil erosion due to water
		CO3	Understand about biological methods of soil erosion control
		CO4	Understand of Water losses: filtration, seepage and evaporation losses
		CO5	Understand the need of planned utilization of water resources
KOE079	Introduction to Women's and Gender Studies	CO1	Understand about Women and Society
		CO2	Know the details of Feminist Theory
		CO3	Know about the socio-economic conditions of women during the age of Industrial revolution
		CO4	Understand Gender Roles and Psychology of sex
		CO5	Understand Gender and Representation (Women's Representation in Literary Texts)

4th Year (8th Semester)

Course Code	Course Name	<u>Course Outcomes (COs)</u>	
		<i>At the completion of the course, students will be able to:</i>	
KHU801	Rural Development: Administration and Planning	CO1	Understand the definitions, concepts and components of Rural Development
		CO2	Know the importance, structure, significance, resources of Indian rural economy
		CO3	Have a clear idea about the area development programmes and its impact.
		CO4	Acquire knowledge about rural entrepreneurship
		CO5	Understand about the using of different methods for human resource planning
KHU802	Project	CO1	Understand need, scope, entrepreneurial competencies & traits



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	Management & Entrepreneurship	CO2	Entrepreneurial idea and innovation
		CO3	Understand project appraisal: Preparation of a real time project feasibility report containing technical appraisal
		CO4	Understand project financing
		CO5	Understand social entrepreneurship
KME851	Project	CO1	Demonstrate a sound technical knowledge of selected project topic
		CO2	Identification of problem, interpretation and solution
		CO3	Formulate engineering solutions to complex problems utilizing a systems approach
		CO4	Design and develop an engineering project and communicate with engineers and the community at large in written an oral form
		CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer

4th Year (Open Electives III & IV List)

Course Code	Course Name	<u>Course Outcomes (COs)</u>	
		<i>At the completion of the course, students will be able to:</i>	
KOE080	Fundamentals Of Drone Technology	CO1	Design UAV drone system
		CO2	Understand working of different types of engines and its area of applications
		CO3	Understand static and dynamic stability dynamic instability and control concepts
		CO4	Know the loads taken by aircraft and type of construction and also construction materials in them
		CO5	Know concept of Navigation and Testing
KOE081	Cloud Computing	CO1	Describe architecture and underlying principles of cloud computing.
		CO2	Explain need, types and tools of Virtualization for cloud
		CO3	Describe Services Oriented Architecture and various types of cloud services.
		CO4	Explain Inter cloud resources management cloud storage services and their providers Assess security services and standards for cloud computing.
		CO5	Analyze advanced cloud technologies.
KOE082	Biomedical Signal Processing	CO1	Understanding of Bio-Medical Signals
		CO2	Explain concept of ECG
		CO3	Understand concept of Data Reduction
		CO4	Understand concept of EEG.
		CO5	Understand concept of EP Estimation
KOE083	Entrepreneurship Development	CO1	Know role of small-scale industries in the national economy



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		C02	Know Project identification, field-study and collection of information of projects
		C03	Know basics of Preparation of balance sheets and assessment of economic viability
		C04	Know basics of Project Planning and control
		C05	Know role of various national and state agencies which render assistance to small scale industries.
KOE084	Introduction to Smart Grid	C01	Understand evaluation and need of smart grid
		C02	Understand smart grid for Home & Building Automation applications
		C03	Understand Intelligent Electronic Devices (IED) & their application for monitoring & protection in smart grids
		C04	Understand Microgrids and Distributed Energy Resources
		C05	Understand Power Quality Management in Smart Grid
KOE085	Quality Management	C01	Know details of Quality Concept, Quality control evaluation
		C02	Know the insights of quality management
		C03	Know the details of Control Charts
		C04	Know the Defects Diagnosis and Prevention
		C05	Know the detailed standards to maintain quality
KOE086	Industrial Optimization Techniques	C01	Understand the Historical development of optimization & its engineering applications
		C02	Understand the concept of sequencing and network analysis
		C03	Understand the concept of 'Theory of Games' and Queueing Models
		C04	Understand the basics of Dynamic Programming and Simulation
		C05	Know the concept of Deterministic and probabilistic (nondeterministic) inventory models and their application in engineering
KOE087	Virology	C01	Learn molecular virology by general principles as opposed to describing each virus family
		C02	Know the details of Consequences of virus infection to animals and human.
		C03	Understand the Classification of viruses and concerned nomenclatures
		C04	Know about Retroviruses: HIV, viral pathogenesis & AIDS.
		C05	Know about the Modern approaches of virus control
KOE089	Human Values in Madhyasth Darshan	C01	Know about Madhyasth Darshan and its Basics
		C02	Know about the general direction and process of evolution in the nature/ existence.
		C03	Understand the theory revealing Human Being as an indivisible part of Nature
		C04	Understand about Fulfillment of human goal of realization and prosperity
		C05	Possibility of finding solutions to present day problems in the light of human values



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KOE094	Digital & Social Media Marketing	CO1	Understand shifting from traditional marketing practices to digital marketing practices
		CO2	Understand social media marketing and tools
		CO3	Understand the concept of online campaign management
		CO4	Understand digital leadership principles and reputation management
		CO5	Understand security and privatization issues with digital marketing

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