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

Vision of College

To create conducive environment in which students acquire professional and ethical qualities to become socially responsible technocrats.

Mission of College

- To impart high quality education and professional skill development to our students.
- To inculcate discipline, team-spirit and critical thinking ability in students.
- To promote the advancement in research and education by providing the supportive environment.
- To provide education that is liberal, inculcate professional behaviour with strong ethical values.

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Department of Civil Engineering (CE)

Vision of the Department

To produce highly competent and skilled civil engineers, through quality engineering education with global perspectives, for the sustainable growth of the society.

Mission of the Department

a. To provide state of the art infrastructure and conducive environment with innovative teaching and learning in the department.
b. To provide sustainable solutions to civil engineering problems through industry-institute interaction by dissemination of knowledge and technical services.
c. To impart soft skills, leadership qualities, professional ethics and human values among civil engineers for successful professional carrier.

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Department of Civil Engineering

Programme: B.Tech. Civil Engineering

Program Educational Objectives (PEOs)

The PEOs of B.Tech. Civil Engineering programme are:

1. To train students to undertake, design and analyze civil engineering projects with social awareness and responsibilities.
2. To train students in such as a way that they can pursue higher studies for research and development of civil engineering and other allied domains.
3. To train students to function effectively and ethically in the multicultural and multidisciplinary teams for the sustainable development and growth of civil engineering projects and profession.

Program Specific Objectives (PSOs)

At the completion of B.Tech Civil Engineering programme, our:

PSO 1: Graduates shall demonstrate sound knowledge in design, analysis, laboratory investigations and construction aspects of civil engineering projects, along with good foundation in mathematics, basic sciences and technical communication.

PSO 2: Graduates will be motivated for continuous self-learning in engineering practice and/or pursue research in advanced areas of civil engineering in order to offer economically viable engineering services to the society, ethically and responsibly.

Graduate Attributes (GAs)

The graduate attributes for students of Civil Engineering department are:

- Engineering knowledge
- Problem analysis
- Design/development of solutions
- Conduct investigations of complex problems
- Modern tool usage
- The engineer and society
- Environment and sustainability
- Ethics
- Individual and team work
- Communication
- Project management and finance
- Life-long learning

Program Outcomes (POs)

The outcomes of the program are statements that describe skills that we expect to enable our students to attain by the time of graduation:

No.	Program Outcomes (POs)
PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional

engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8   **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9   **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10   **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11   **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12   **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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Department of Civil Engineering (CE)

Programme: B.Tech. Civil Engineering

Course Outcomes (COs)

2nd Year (3rd Semester)

Course Code	Course Name	Course Outcomes (COs)	
		At the completion of the course, students will be able to:	
KAS303	**Maths-III**	**CO1**	Remember the concept of Laplace transform and apply in solving real life problems
		CO2	Understand the concept of Fourier and Z – transform to evaluate engineering problems
		CO3	Remember the concept of Formal Logic, Group and Rings to evaluate real life problems
		CO4	Apply the concept of Set, Relation, function and Counting Techniques
		CO5	Apply the concept of Lattices and Boolean Algebra to create Logic Gates and Circuits, Truth Table, Boolean Functions, Karnaugh Maps

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KOE038/ 048	**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
KAS301	**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 their efficacy as fluent & efficient communicators by learning the voice-dynamics
KVE 301	**Universal Human Values and Professional Ethics**	CO1	Understand value inputs, need, basic guidelines, content and process of value education in current scenario of the society
		CO2	Understand the meaning of Harmony in the Self the Co-existence of Self and Body
		CO3	Understand the value of harmony 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 during work
KCE 301	**Engineering Mechanics**	CO1	Use scalar and vector analytical techniques for analyzing forces in statically determinate structures
		CO2	Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems
		CO3	Apply basic knowledge of mathematics and physics to solve real-world problems
		CO4	Understand basic dynamics concepts – force, momentum, work and energy
		CO5	Understand and be able to apply Newton's laws of motion
KCE 302	**Surveying & Geomatics**	CO1	Describe the function of surveying and work with survey instruments, take observations, and prepare plan, profile, and cross-section and perform calculations.
		CO2	Calculate, design and layout horizontal and vertical curves.

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		CO3	Operate a total station and GPS to measure distance, angles, and to calculate differences in elevation. Reduce data for application in a geographic information system.
		CO4	Relate and apply principles of photogrammetry for surveying
		CO5	Apply principles of Remote Sensing and Digital Image Processing for Civil Engineering problems.
KCE 303	Fluid Mechanics	CO1	Understand the broad principles of fluid statics, kinematics and dynamics
		CO2	Understand definitions of the basic terms used in fluid mechanics
		CO3	Understand classifications of fluid flow
		CO4	Apply the continuity, momentum and energy principle
		CO5	Apply dimensional analysis
KCE 351	Building Planning and Drawing Lab	CO1	Apply the principles of planning and bye-laws (National building code) used for building planning
		CO2	Draft the plan, elevation and sectional views of the buildings using AutoCAD
KCE 352	Surveying and Geomatics Lab	CO1	Demonstrate and handle various conventional surveying instruments such as chain/tape, compass, theodolite, auto-level in the field of civil engineering applications such as highyway profiling, setting out curves etc
		CO2	Measure distances, horizontal & vertical angles and coordinates using electronic total station
		CO3	Apply the principles of photogrammetric surveying and take observations using mirror stereoscope and parallax bar
		CO4	Measure coordinates using GPS and understand digitization using GIS and visual interpretation of standard FCC
KCE 353	Fluid Mechanics Lab	CO1	Evaluate Bernaulli's Theorem & Momentum equation in pipe flow
		CO2	Apply continuity equation and flow visualisation in pipe flow
		CO3	Verify the concept of buoyancy and hence metacentre point
		CO4	Illustrate the concept of wind tunnel
KCE354	Mini Project or Internship Assessment	CO1	Understand a system, component or process to meet desired progress of project
		CO2	Prepare Project Report for a project in Civil Engineering domain
KNC 301	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

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		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

2nd Year (4th Semester)

Course Code	Course Name	Course Outcomes (COs) *At the completion of the course, students will be able to:*	
KAS403	**Mathematics-III**	CO1	Remember the concept of Laplace transform and apply in solving real life problems
		CO2	Understand the concept of Fourier and Z – transform to evaluate engineering problems
		CO3	Remember the concept of Formal Logic, Group and Rings to evaluate real life problems
		CO4	Apply the concept of Set, Relation, function and Counting Techniques
		CO5	Apply the concept of Lattices and Boolean Algebra to create Logic Gates and Circuits, Truth Table, Boolean Functions, Karnaugh Maps
KVE401	**Universal Human Values**	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

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		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	To evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics
KCE401	**Material Testing & Construction Practices**	CO1	Identify various building materials and to understand their basic properties.
		CO2	Understand the use of non-conventional civil engineering materials.
		CO3	Study suitable type of flooring and roofing in the construction process
		CO4	Characterize the concept of plastering, pointing and various other building services.
		CO5	Exemplify the various fire protection, sound and thermal insulation techniques, maintenance and repair of buildings.
KCE402	**Introduction To Solid Mechanics**	CO1	Describe the concepts and principles of stresses and strains
		CO2	Analyze solid mechanics problems using classical methods and energy methods
		CO3	Analyze structural members subjected to combined stresses
		CO4	Calculate the deflections at any point on a beam subjected to a combination of loads
		CO5	Understand the behavior of columns, springs and cylinders against loads.
KCE403	**Hydraulics Engineering & Machines**	CO1	Solve problems related to free surface flow in an open channel
		CO2	Apply energy depth relationships for gradually varied flow in steady state conditions
		CO3	Apply the concept of Rapidly Varied Flow in Open Channel Flow in steady state conditions

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		CO4	Explain the working principle, operation, and performance of pumps
		CO5	Summarize the working principle of hydraulic turbines and their characteristics
KCE451	**Material Testing Lab**	CO1	Determine the quality of bricks, cement, fine aggregate and coarse aggregate and its suitability for construction purpose
		CO2	Design the mix, make the specimens and test the same for the strength for comparison with design strength
		CO3	Develop ability to function as a member of a team to complete the assigned task
KCE452	**Solid Mechanics Lab**	CO1	Verify the deflection in different structural members by using apparatus
		CO2	Determine the engineering properties of solid Materials
		CO3	Explain the behaviour of beams and columns under different end conditions
KCE453	**Hydraulics & Hydraulic Machine Lab**	CO1	Investigate flow characteristics and various parameters for open channel
		CO2	Assess the performance of pumps and turbines
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
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

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3rd Year (5th Semester)

Course Code	Course Name	Course Outcomes (COs) At the completion of the course, students will be able to:	
KCE501	Geotechnical Engineering	CO1	Classify the soil and determine its Index properties
		CO2	Evaluate permeability and seepage properties of soil
		CO3	Interpret the compaction and consolidation characteristics & effective stress concept of soil
		CO4	Determine the vertical and shear stress under different loading conditions and explain the phenomenon of soil liquefaction.
		CO5	Interpret the earth pressure and related slope failures
KCE502	Structural Analysis	CO1	Explain type of structures and method for their analysis
		CO2	Analyze different types of trusses for member forces
		CO3	Compute slope and deflection in determinate structures using different methods
		CO4	Apply the concept of influence lines and moving loads to compute bending moment and shear force at different sections
		CO5	Analyze determinate arches for different loading conditions
KCE503	Quantity Estimation and Construction Management	CO1	Understand the importance of units of measurement and preliminary estimate for administrative approval of projects
		CO2	Understand the contracts and tender documents in construction projects
		CO3	Analyze and assess the quantity of materials required for civil engineering works as per specifications
		CO4	Evaluate and estimate the cost of expenditure and prepare a detailed rate analysis report
		CO5	Analyze and choose cost effective approach for civil engineering projects
KCE051	Department Elective-I (Concrete Technology)	CO1	Understand the properties of constituent material of concrete
		CO2	Apply admixtures to enhance the properties of concrete
		CO3	Evaluate the strength and durability parameters of concrete
		CO4	Design the concrete mix for various strengths using difference methods
		CO5	Use advanced concrete types in construction industry
KCE055	Department Elective-II (Engineering Hydrology)	CO1	Understand the basic concept of hydrological cycle and its various phases
		CO2	Understand the concept of runoff and apply the knowledge to construct the hydrograph

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		CO3	Apply the various methods to assess the flood
		CO4	Assess the quality of various forms of water and their aquifer properties
		CO5	Understand the well hydraulics and apply ground water modelling techniques
KCE551	**CAD Lab**	CO1	Understand latest software tools in analysis and design of civil engineering
		CO2	Apply software tools for geotechnical engineering purpose
		CO3	Apply software tools for surveying
KCE552	**Geotechnical Engineering Lab**	CO1	Determine index properties of soil sample
		CO2	Classify the soils on the basis of standards
		CO3	Determine permeability and compaction characteristics of soil
		CO4	Assess shear strength parameters of soil samples
KCE553	**Quantity Estimation and Management Lab**	CO1	Estimate the quantities for projects of civil engineering domain
		CO2	Prepare Bill of Quantities (BOQ) for projects undertaken
		CO3	Practice on project management software to manage the projects
		CO4	Have knowledge to study the tender documents
KCE554	**Mini Project or Internship Assessment**	CO1	Compose project report for a project in civil engineering domain
		CO2	Design a system, component or process to meet desired progress of project
		CO3	Formulate solution to the different civil engineering projects
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	Understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective
		CO2	Have basic principles of thought process, reasoning and inference to identify the roots and details of contemporary issues faced by our nation and will try to locate possible solutions to these challenges
		CO3	Understand the importance of our surroundings and encouragement to contribute towards sustainable development

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| | | CO4 | Awareness of 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 |
| | | CO5 | Knowledge of Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system |

3rd Year (6th Semester)

Course Code	Course Name	Course Outcomes (COs) At the completion of the course, students will be able to:	
KCE601	Design of Concrete Structure	CO1	Analyze and Design RCC beams for flexure by IS methods
		CO2	Analyze and Design RCC beams for shear by IS method
		CO3	Analyze and Design RCC slabs and staircase by IS methods
		CO4	Design the RCC compression members by IS methods
		CO5	Design various types of footings and cantilever retaining wall
KCE602	Transportation Engineering	CO1	Understand the history of road development, their alignment & Survey
		CO2	Design the various geometric parameters of road
		CO3	Study the traffic characteristics & design of road intersections & signals
		CO4	Examine the properties of highway materials & their implementation in design of pavements
		CO5	Learn methods to construct various types of roads
KCE603	Environmental Engineering	CO1	Assess water demand and optimal size of water mains
		CO2	Layout the distribution system & assess the capacity of reservoir
		CO3	Investigate physical, chemical & biological parameter of water
		CO4	Design treatment units for water and waste water
		CO5	Apply emerging technologies for treatment of waste water
KCE064	Foundation Design	CO1	Understand various methods of Soil Exploration and its importance
		CO2	Analyze bearing capacity and settlement of soil for shallow foundation
		CO3	Design the various types of shallow foundation and understand the basics of deep foundation

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		CO4	Understand the characteristics of well foundations and retaining wall
		CO5	Understand the concept of soil reinforcement
KOE069	**Open Elective -1 (Understanding the Human Being Comprehensively – Human Aspirations and Its Fulfillment)**	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	Understand the human tradition and its various components
		CO4	Understand co-existence with other orders
		CO5	Live with harmony from self to entire existence
KCE651	**Transportation Engineering Lab**	CO1	Determine properties of aggregates and assess its suitability in construction for transportation infrastructure
		CO2	Determine properties of bitumen and check its suitability for pavement construction
		CO3	Investigate traffic and speed study
		CO4	Determine CBR Value of soil
KCE652	**Environmental Engineering Lab**	CO1	Measure and compare the physical, chemical and biological properties of water & wastewater
		CO2	Measure the level of air pollution (Particulate Matter) and noise pollution
KCE653	**Structural Detailing Lab**	CO1	Study of standards for detailing of structural elements
		CO2	Apply software tools for structural drafting and detailing of building components.
		CO3	Create bar bending schedule for structural components of a building
		CO4	Understand full set of structural drawing of a building
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	Understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective
		CO2	Have basic principles of thought process, reasoning and inference to identify the roots and details of contemporary issues faced by our nation and will try to locate possible solutions to these challenges

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		CO3	Understand the importance of our surroundings and encouragement to contribute towards sustainable development
		CO4	Aware of 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
		CO5	Know Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

4th Year (7th Semester)

Course Code	Course Name	Course Outcomes (COs) At the completion of the course, students will be able to:	
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	Know the need and scope of entrepreneurship
		CO2	Know the entrepreneurial idea and innovation
		CO3	Know the insights of Project Management
		CO4	Know the insights of Project Financing
		CO5	Know the idea and insights of Social Entrepreneurship
KCE070	Railway, Waterway and Airway Engineering	CO1	Explain the importance of railway infrastructure
		CO2	Identify the factors governing design of railway infrastructures
		CO3	Analysis and design the railway track system
		CO4	Understand the concepts of airport engineering and design components of airport
		CO5	Associate with the concepts of water transport system
KCE075	Design of Steel Structures	CO1	Understand properties of steel and types of loads acting on steel structures
		CO2	Design welded and bolted type of connections for elementary steel structures.

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		CO3	Design tension members for elementary steel structures.
		CO4	Design compression members such as simple columns, braced and latticed columns and column bases.
		CO5	Design flexural members such as beams, purlins and girders
KOE074	Open Elective-II (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
KCE751	Concrete Lab	CO1	Understand the standard codes for concrete constituents
		CO2	Evaluate the properties of constituent material of concrete
		CO3	Assess the quality parameters of fresh & hardened concrete
		CO4	Design the concrete mix for desired strength
		CO5	Evaluate strength of concrete using Non-Destructive methods
KCE752	Mini Project or Internship Assessment	CO1	Understand work related to preparation of bill of quantity & tender documents
		CO2	Understand work related to design & drawing of flat slab using IS code method
		CO3	Understand the work related to cost estimation of (including market survey of rates by students) building/earthwork for highway
		CO4	Understand the work related to scheduling of activities of a project using software
		CO5	Understand the work related to preparation of layout plan of a building and its marking on ground
KCE753	Project	CO1	Work effectively as an individual and member of the team to solve complex civil engineering problems
		CO2	Apply engineering knowledge to solve real life problems and involve in self-learning process
		CO3	Apply modern tools for analysis and design of complex engineering problems
		CO4	Develop ethical solutions of engineering problems taking into account its impact on society, environment and sustainability
		CO5	Compose and present detailed project report of his/ her work and defend effectively

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Sahzadpur Pauri, NH-2, Agra-Mathura Highway, Mathura-281122, Uttar Pradesh
Website: www.eshancollege.com

4th Year (8th Semester)

Course Code	Course Name	Course Outcomes (COs) At the completion of the course, students will be able to:	
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 Management & Entrepreneurship	CO1	Know the need and scope of entrepreneurship
		CO2	Know the entrepreneurial idea and innovation
		CO3	Know the insights of Project Management
		CO4	Know the insights of Project Financing
		CO5	Know the idea and insights of Social Entrepreneurship
KOE085	Open Elective-III (Quality Management)	CO1	Know details of Quality Concept, Quality control evaluation
		CO2	Know the insights of quality management
		CO3	Know the details of Control Charts
		CO4	Know the Defects Diagnosis and Prevention
		CO5	Know the detailed standards to maintain quality
KOE094	Open Elective – IV (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
KCE851	Project	CO1	Work effectively as an individual and member of the team to solve complex civil engineering problems
		CO2	Apply engineering knowledge to solve real life problems and involve in self-learning process
		CO3	Apply modern tools for analysis and design of complex engineering problems

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| | | CO4 | Develop ethical solutions of engineering problems taking into account its impact on society, environment and sustainability |
| | | CO5 | Compose and present detailed project report of his/ her work and defend effectively |

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Department of Computer Science & Engineering (CSE)

Vision of the Department

To produce highly competent and innovative computer science professionals through excellence in teaching and training with latest tools & technologies.

Mission of the Department

a. To impart high quality education and professional training to our students by providing conducive environment and state of the art infrastructure.
b. To inculcate leadership skills in students and encourage them to become globally competent professionals.
c. To render value based education to students to take better engineering decision with social consciousness and to meet out the global standards.

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Department of Computer Science & Engineering (CSE)

Programme: B.Tech. Computer Science & Engineering

Program Educational Objectives (PEOs)

The PEOs of B.Tech. Computer Science &Engineering programme are:

1. To groom the graduates of the programme for logical and practical approach to problem solving and function effectively as skilled computer professional sensitive enough to continuously changing customers needs with a well-balanced preparation in engineering fundamentals and practical application.
2. To enable the graduates of the programme to work in multicultural and multidisciplinary teams for effective problem solving and understand the need of cost effectiveness and sustainability.
3. To enable the graduates of the programme in applying basic principles and practices of computing grounded in mathematics and science for successfully completing projects & engage in research.

Program Specific Objectives (PSOs)

At the completion of B.Tech Computer Science & Engineering programme, our:

PSO 1: Graduate will be able to apply theoretical and practical knowledge of computer science to develop solutions to the real time problems.

PSO 2:   Graduate will be able to apply and demonstrate the acquired knowledge of computer science and engineering in response to emerging trends and contemporary technologies of the field.

Graduate Attributes (GAs)

The graduate attributes for students of Computer Science & Engineering department are:

- Engineering knowledge
- Problem analysis
- Design/development of solutions
- Conduct investigations of complex problems
- Modern tool usage
- The engineer and society
- Environment and sustainability
- Ethics
- Individual and team work
- Communication
- Project management and finance
- Life-long learning

Program Outcomes (POs)

The outcomes of the program are statements that describe skills that we expect to enable our students to attain by the time of graduation:

No.	Program Outcomes (POs)
PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to

complex engineering activities with an understanding of the limitations.

PO 6   **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7   **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8   **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9   **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10   **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11   **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12   **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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Department of Computer Science & Engineering

Programme: B.Tech. Computer Science & Engineering

Course Outcomes (COs)

2nd Year (3rd Semester)

Course Code	Course Name	Course Outcomes (COs) *At the completion of the course, students will be able to:*	
KOE038	**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	The idea of partial differentiation and types of partial differential equations
		CO2	The idea of classification of second partial differential equations, wave, heat equation and transmission lines
		CO3	The basic ideas of statistics including measures of central tendency, correlation, regression and their properties

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		CO4	The idea s of probability and random variables and various discrete and continuous probability distributions and their properties
		CO5	The statistical methods of studying data samples, hypothesis testing and statistical quality control, control charts and their properties
KAS301	**Technical Communication**	CO1	To understand the nature and objective of Technical Communication relevant for the work place as Engineers
		CO2	To 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	To evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics
KVE301	**Universal Human Values**	CO1	Understand value inputs, need, basic guidelines, content and process of value education in current scenario of the society
		CO2	Understand the meaning of Harmony in the Self the Co-existence of Self and Body
		CO3	Understand the value of harmony 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 during work
KCS301	**Data Structure**	CO1	Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications
		CO2	Discuss the computational efficiency of the sorting and searching algorithms
		CO3	Implementation of Trees and Graphs and perform various operations on these data structure
		CO4	Understanding the concept of recursion, application of recursion and its implementation and removal of recursion
		CO5	Identify the alternative implementations of data structures with respect to its performance to solve a real-world problem
KCS302	**Computer Organization and Architecture**	CO1	Study of the basic structure and operation of a digital computer system
		CO2	Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic

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			operations.
		CO3	Implementation of control unit techniques and the concept of Pipelining
		CO4	Understanding the hierarchical memory system, cache memories and virtual memory
		CO5	Understanding the different ways of communicating with I/O devices and standard I/O interfaces
KCS303	**Discrete Structures and Theory of Logic**	CO1	Write an argument using logical notation and determine if the argument is or is not valid
		CO2	Understand the basic principles of sets and operations in sets
		CO3	Demonstrate an understanding of relations and functions and be able to determine their properties
		CO4	Demonstrate different traversal methods for trees and graphs
		CO5	Model problems in Computer Science using graphs and trees
KCS351	**Data Structure using C lab**	CO1	Demonstrate familiarity with major algorithms and data structures
		CO2	Calculate and analyze performance of algorithms
		CO3	Choose the appropriate data structure and algorithm design method for a specified application
		CO4	Identify which algorithm or data structure to use in different scenarios
		CO5	Familiar with writing recursive methods
KCS352	**Computer Organization Lab**	CO1	Illustrate HALF ADDER, FULL ADDER using basic logic gates and to learn various code conversions: Binary-to-Gray, Gray-to-Binary
		CO2	Design 3-8-line DECODER and Implementing 4x1 and 8x1 MULTIPLEXERS
		CO3	Demonstrate excitation tables of various FLIP-FLOPS and design of an 8-bit Input/ Output system with four 8-bit Internal Registers
		CO4	Design of an 8-bit ARITHMETIC LOGIC UNIT
		CO5	Designing of I/O using Registers, ALU and Control Unit and demonstrating the usage of Register Transfer Language (RTL)
KCS353	**Discrete Structure & Logic Lab**	CO1	Knowledge of logical notation to define and reason the fundamental mathematical concepts such as sets relations, functions, and integers
		CO2	Discuss various structures and properties of modern algebra
		CO3	Employ their logical ability such as reasoning able to setup mathematical model of real-life problem by applying advanced counting and computing techniques like generating function and recurrence relation
		CO4	Demonstrate problems in different areas of computer science

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			using trees and graphs
		CO5	Design solution with the help of induction hypotheses, simple induction proofs and recurrences
KCS354	Mini Project or Internship Assessment	CO1	Discover potential research areas in the field of IT
		CO2	Compare and contrast the several existing solutions for research challenge
		CO3	Demonstrate an ability to work in teams and manage the conduct of the research study
		CO4	Formulate and propose a plan for creating a solution for the research plan identified
		CO5	To report and present the findings of the study conducted in the preferred domain
KNC301	Computer System Security	CO1	To discover software bugs that pose cyber security threats and to explain how to fix the bugs to mitigate such threats
		CO2	To discover cyber-attack scenarios to web browsers and web servers and to explain how to mitigate such threats
		CO3	To discover and explain mobile software bugs posing cyber security threats, explain and recreate exploits, and to explain mitigation techniques.
		CO4	To articulate the urgent need for cyber security in critical computer systems, networks, and world wide web, and to explain various threat scenarios
		CO5	To articulate the well-known cyber-attack incidents, explain the attack scenarios, and explain mitigation techniques.
KNC302	Python Programming	CO1	To read and write simple Python programs
		CO2	To develop Python programs with conditionals and loops
		CO3	To define Python functions and to use Python data structures – lists, tuples, dictionaries
		CO4	To do input/output with files in Python
		CO5	To do searching,sorting and merging in Python
KOE034	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	Basics Data Structure and Algorithms	CO1	Understand and analyze the time and space complexity of an algorithm
		CO2	Understand and implement fundamental algorithms (including

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			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	**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	**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

2nd Year (4thSemester)

Course Code	Course Name	Course Outcomes (COs)
		At the completion of the course, students will be able to:
KAS402	**MathsIV**	CO1 — The idea of partial differentiation and types of partial differential equations
		CO2 — The idea of classification of second partial differential equations, wave, heat equation and transmission lines
		CO3 — The basic ideas of statistics including measures of central tendency, correlation, regression and their properties
		CO4 — The idea s of probability and random variables and various discrete and continuous probability distributions and their

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			properties
		CO5	The statistical methods of studying data samples, hypothesis testing and statistical quality control, control charts and their properties
KVE401	Universal Human Values	CO1	Understand the significance of value inputs in a classroom, distinguish between values andskills, 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 naturallyacceptable 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
KAS301	Technical Communication	CO1	Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers
		CO2	Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions
		CO3	Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience
		CO4	Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence
		CO5	It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics
KCS401	Operating Systems	CO1	Understand the structure and functions of OS
		CO2	Learn about Processes, Threads and Scheduling algorithms
		CO3	Understand the principles of concurrency and Deadlocks
		CO4	Learn various memory management scheme
		CO5	Study I/O management and File systems
KCS402	Theory of Automata and Formal	CO1	Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars
		CO2	Analyse and design, Turing machines, formal languages, and

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	Languages		grammars
		CO3	Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving
		CO4	Prove the basic results of the Theory of Computation
		CO5	State and explain the relevance of the Church-Turing thesis
KCS403	**Microprocessor**	CO1	Apply a basic concept of digital fundamentals to Microprocessor based personal computer system
		CO2	Analyze a detailed s/w & h/w structure of the Microprocessor
		CO3	Illustrate how the different peripherals (8085/8086) are interfaced with Microprocessor
		CO4	Analyze the properties of Microprocessors (8085/8086)
		CO5	Evaluate the data transfer information through serial & parallel ports
KCS451	**Operating Systems Lab**	CO1	Understand and apply knowledge of basic UNIX/LINUX commands to solve various software problems and to automate real time applications
		CO2	Understand and implement the concept of process synchronization tool like semaphore to solve mutual exclusion problem in order to coordinate concurrent process
		CO3	Apply knowledge of process management techniques to design and solve various processsynchronization problems like Producer Consumer problem, Reader Writer problem and dining philosopher's problem
		CO4	Compare and contrast among various CPU scheduling algorithms and apply knowledge to identify the best scheduling algorithm as per software requirement
		CO5	Understand and apply the concepts of deadlock in operating systems to design and implement various deadlock avoidance algorithms like Banker's algorithm used in banking system
		CO6	Understand and apply knowledge of basic UNIX/LINUX commands to solve various software problems and to automate real time applications
KCS452	**Microprocessor Lab**	CO1	Design and implement programs on 8085 microprocessor
		CO2	Design and implement programs on 8086 microprocessor
		CO3	Design interfacing circuits with 8085
		CO4	Design interfacing circuits with 8086
		CO5	Design and implement 8051 microcontroller based systems
KCS453	**Python Language Programming Lab**	CO1	Demonstrate familiarity with major algorithms and data structures
		CO2	Calculate and analyze performance of algorithms
		CO3	Choose the appropriate data structure and algorithm design

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			method for a specified application
		CO4	Identify which algorithm or data structure to use in different scenarios
		CO5	Familiar with writing recursive methods
KNC402	Python Programming	CO1	To read and write simple Python programs
		CO2	To develop Python programs with conditionals and loops
		CO3	To define Python functions and to use Python data structures – lists, tuples, dictionaries
		CO4	To do input/output with files in Python
		CO5	To do searching, sorting and merging in Python
KNC401	Computer System Security	CO1	To discover software bugs that pose cyber security threats and to explain how to fix the bugs to mitigate such threats
		CO2	To discover cyber attack scenarios to web browsers and web servers and to explain how to mitigate such threats
		CO3	To discover and explain mobile software bugs posing cyber security threats, explain and recreate exploits, and to explain mitigation techniques
		CO4	To articulate the urgent need for cyber security in critical computer systems, networks, and world wide web, and to explain various threat scenarios
		CO5	To articulate the well-known cyber-attack incidents, explain the attack scenarios, and explain mitigation techniques
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
KOE045	Basics Data Structure and Algorithms	CO1	Understand and analyze the time and space complexity of an algorithm
		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

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Course Code	Course Name		
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
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
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

3rdYear (5th Semester)

Course Code	Course Name	Course Outcomes (COs)	
		At the completion of the course, students will be able to:	
KCS501	Database Management System	CO1	Apply knowledge of database for real life applications
		CO2	Apply query processing techniques to automate the real time problems of databases
		CO3	Identify and solve the redundancy problem in database tables using normalization
		CO4	Understand the concepts of transactions, their processing so they

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			will familiar with broad range of database management issues including data integrity, security and recovery
		CO5	Design, develop and implement a small database project using database tools
KCS502	Compiler Design	CO1	Acquire knowledge of different phases and passes of the compiler and also able to use the compiler tools like LEX, YACC, etc. Students will also be able to design different types of compiler tools to meet the requirements of the realistic constraints of compilers
		CO2	Understand the parser and its types i.e Top-Down and Bottom-up parsers and construction of LL, SLR, CLR, and LALR parsing table
		CO3	Implement the compiler using syntax-directed translation method and get knowledge about the synthesized and inherited attributes
		CO4	Acquire knowledge about run time data structure like symbol table organization and different techniques used in that
		CO5	Understand the target machine's run time environment, its instruction set for code generation and techniques used for code optimization
KCS503	Design and Analysis of Algorithm	CO1	Design new algorithms, prove them correct, and analyze their asymptotic and absolute runtime and memory demands
		CO2	Find an algorithm to solve the problem (create) and prove that the algorithm solves the problem correctly (validate)
		CO3	Understand the mathematical criterion for deciding whether an algorithm is efficient, and know many practically important problems that do not admit any efficient algorithms
		CO4	Apply classical sorting, searching, optimization and graph algorithms
		CO5	Understand basic techniques for designing algorithms, including the techniques of recursion, divide-and-conquer, and greedy
KCS051	Data Analytics	CO1	Describe the life cycle phases of Data Analytics through discovery, planning and building
		CO2	Understand and apply Data Analysis Techniques
		CO3	Implement various Data streams
		CO4	Understand item sets, Clustering, frame works & Visualizations
		CO5	Apply R tool for developing and evaluating real time applications
KCS052	Web Designing	CO1	Understand principle of Web page design and about types of websites
		CO2	Visualize and recognize the basic concept of HTML and application in web designing
		CO3	Recognize and apply the elements of Creating Style Sheet (CSS)

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		CO4	Understand the basic concept of Java Script and its application
		CO5	Introduce basics concept of Web Hosting and apply the concept of SEO
KCS053	Computer Graphics	CO1	Understand the graphics hardware used in field of computer graphics
		CO2	Understand the concept of graphics primitives such as lines and circle based on different algorithms
		CO3	Apply the 2D graphics transformations, composite transformation and Clipping concepts
		CO4	Apply the concepts of and techniques used in 3D computer graphics, including viewing transformations
		CO5	Perform the concept of projections, curve and hidden surfaces in real life
KCS054	Object Oriented System Design	CO1	Understand the application development and analyze the insights of object oriented programming to implement application
		CO2	Understand, analyze and apply the role of overall modeling concepts (i.e. System, structural)
		CO3	Understand, analyze and apply oops concepts (i.e abstraction, inheritance)
		CO4	Understand the basic concepts of C++ to implement the object oriented concepts
		CO5	To understand the objectoriented approach to implement real world problem
KCS055	Machine Learning Techniques	CO1	To understand the need for machine learning for various problem solving
		CO2	To understand a wide variety of learning algorithms and how to evaluate models generated from data
		CO3	To understand the latest trends in machine learning
		CO4	To design appropriate machine learning algorithms and apply the algorithms to a real-world problems
		CO5	To optimize the models learned and report on the expected accuracy that can be achieved by applying the models
KCS056	Application of Soft Computing	CO1	Recognize the feasibility of applying a soft computing methodology for a particular problem
		CO2	Understand the concepts and techniques of soft computing and foster their abilities in designing and implementing soft computing-based solutions for real-world and engineering problems
		CO3	Apply neural networks to pattern classification and regression problems and compare solutions by various soft computing approaches for a given problem
		CO4	Apply fuzzy logic and reasoning to handle uncertainty and solve

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			engineering problems
		CO5	Apply genetic algorithms to combinatorial optimization problems
KCS057	**Augmented and Virtual Reality**	CO1	To make students know the basic concept and understand the framework of virtual reality
		CO2	To understand principles and multidisciplinary features of virtual reality and apply it in developing applications
		CO3	To know the technology for multimodal user interaction and perception VR, in particular the visual, audial and haptic interface and behavior
		CO4	To understand and apply technology for managing large scale VR environment in real time
		CO5	To understand an introduction to the AR system framework and apply AR tools in software development
KCS058	**Human Computer Interface**	CO1	Understand and analyze the common methods in the user-centered design process and the appropriateness of individual methods for a given problem.
		CO2	Apply, adapt and extend classic design standards, guidelines, and patterns.
		CO3	Employ selected design methods and evaluation methods at a basic level of competence.
		CO4	Build prototypes at varying levels of fidelity, from paper prototypes to functional, interactive prototypes.
		CO5	Demonstrate sufficient theory of human computer interaction, experimental methodology and inferential statistics to engage with the contemporary research literature in interface technology and design.
KCS551	**Database Management Systems Lab**	CO1	Understand and apply oracle 11 g products for creating tables, views, indexes, sequences and other database objects.
		CO2	Design and implement a database schema for company data base, banking data base, library information system, payroll processing system, student information system
		CO3	Write and execute simple and complex queries using DDL, DML, DCL and TCL
		CO4	Write and execute PL/SQL blocks, procedure functions, packages and triggers, cursors.
		CO5	Enforce entity integrity, referential integrity, key constraints, and domain constraints on database.
KCS552	**Compiler Design Lab**	CO1	Identify patterns, tokens & regular expressions for lexical analysis
		CO2	Design Lexical analyser for given language using C and LEX /YACC tools

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		CO3	Design and analyze top down and bottom up parsers
		CO4	Generate the intermediate code
		CO5	Generate machine code from the intermediate code forms
KCS553	**Design and Analysis of Algorithm Lab**	CO1	Implement algorithm to solve problems by iterative approach
		CO2	Implement algorithm to solve problems by divide and conquer approach
		CO3	Implement algorithm to solve problems by Greedy algorithm approach
		CO4	Implement algorithm to solve problems by Dynamic programming, backtracking, branch and bound approach
		CO5	Implement algorithm to solve problems by branch and bound approach
KCS554	**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
		CO5	Learning professional skills like exercising leadership, behaving professionally, behaving ethically, listening effectively, participating as a member of a team, developing appropriate workplace attitudes
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	To get basic principles of thought process, reasoning and inference to identify the roots and details of contemporary issues faced by our nation and try to locate possible solutions
		CO2	To understand the importance of our surroundings and encourage the students to contribute towards sustainable development
		CO3	To sensitize towards issues related to 'Indian' culture, tradition and its composite character

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		CO4	To aware of 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
		CO5	To acquaint with Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

3rdYear (6th Semester)

Course Code	Course Name	Course Outcomes (COs) *At the completion of the course, students will be able to:*	
KCS601	**Software Engineering**	CO1	Explain various software characteristics and analyze different software Development Models
		CO2	Demonstrate the contents of a SRS and apply basic software quality assurance practices to ensure that design, development meet or exceed applicable standards
		CO3	Compare and contrast various methods for software design
		CO4	Formulate testing strategy for software systems, employ techniques such as unit testing, Test driven development and functional testing
		CO5	Manage software development process independently as well as in teams and make use of Various software management tools for development, maintenance and analysis
KCS602	**Web Technology**	CO1	Explain web development Strategies and Protocols governing Web
		CO2	Develop Java programs for window/web-based applications
		CO3	Design web pages using HTML, XML, CSS and JavaScript
		CO4	Creation of client-server environment using socket programming
		CO5	Building enterprise level applications and manipulate web databases using JDBC
		CO6	Design interactive web applications using Servlets and JSP
KCS603	**Computer Networks**	CO1	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission
		CO2	Apply channel allocation, framing, error and flow control

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			techniques
		CO3	Describe the functions of Network Layer i.e Logical addressing, subnetting & Routing Mechanism
		CO4	Explain the different Transport Layer function i.e Port addressing, Connection Management, Error control and Flow control mechanism
		CO5	Explain the functions offered by session and presentation layer and their Implementation
		CO6	Explain the different protocols used at application layer i.e HTTP, SNMP, SMTP, FTP, TELNET and VPN
KCS061	Big Data	CO1	Demonstrate knowledge of Big Data Analytics concepts and its applications in business
		CO2	Demonstrate functions and components of Map Reduce Framework and HDFS
		CO3	Discuss Data Management concepts in NoSQL environment
		CO4	Explain process of developing Map Reduce based distributed processing applications
		CO5	Explain process of developing applications using HBASE, Hive, Pig etc
KCS062	Image Processing	CO1	Explain the basic concepts of two-dimensional signal acquisition, sampling, quantization and color model
		CO2	Apply image processing techniques for image enhancement in both the spatial and frequency domains
		CO3	Apply and compare image restoration techniques in both spatial and frequency domain
		CO4	Compare edge based and region-based segmentation algorithms for ROI extraction
		CO5	Explain compression techniques and descriptors for image processing
KCS063	Real Time System	CO1	Illustrate the need and the challenges in the design of hard and soft real time systems
		CO2	Compare different scheduling algorithms and the schedulable criteria
		CO3	Discuss resource sharing methods in real time environment
		CO4	Compare and contrast different real time communication and medium access control techniques
		CO5	Analyze real time Operating system and Commercial databases
KCS064	Data Compression	CO1	Describe the evolution and fundamental concepts of Data Compression and Coding Techniques
		CO2	Apply and compare different static coding techniques (Huffman & Arithmetic coding) for text compression

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		CO3	Apply and compare different dynamic coding techniques (Dictionary Technique) for text compression
		CO4	Evaluate the performance of predictive coding technique for Image Compression
		CO5	Apply and compare different Quantization Techniques for Image Compression
KCS651	**Software Engineering Lab**	CO1	Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement
		CO2	Identify different actors and use cases from a given problem statement and draw use case diagram to associate use cases with different types of relationship
		CO3	Draw a class diagram after identifying classes and association among them
		CO4	Graphically represent various UML diagrams, and associations among them and identify the logical sequence of activities undergoing in a system, and represent them pictorially
		CO5	Able to use modern engineering tools for specification, design, implementation and testing
KCS652	**Web Technology Lab**	CO1	Develop static web pages using HTML
		CO2	Develop Java programs for window/web-based applications
		CO3	Design dynamic web pages using Javascript and XML
		CO4	Design dynamic web page using server site programming Ex. ASP/JSP/PHP
		CO5	Design server site applications using JDDC,ODBC and section tracking API
KCS653	**Computer Networks Lab**	CO1	Simulate different network topologies
		CO2	Implement various framing methods of Data Link Layer
		CO3	Implement various Error and flow control techniques
		CO4	Implement network routing and addressing techniques
		CO5	Implement transport and security mechanisms
KOE060	**Idea to Business Model**	CO1	Enhance creative knowledge of students regarding selection of a business idea and it's 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	Develop knowledge on Production systems and it's sustainability through production, planning and control (PPC)
		CO5	Develop appropriate business model and apply in a better way

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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, Piezoresistance 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
		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

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			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 the Human Being Comprehensively – Human Aspirations and Its Fulfillment**	CO1	To have clarity about human aspirations, goal, activities and purpose of life
		CO2	To understand the harmony in nature/existence and participation of human being in the nature/existence.
		CO3	To understand the human tradition and its various components
		CO4	To understand co-existence with other orders
		CO5	To live with 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

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Course Code	Course Name		Course Outcomes
			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 Tradition, Cultural and Society	CO1	To get basic principles of thought process, reasoning and inference to identify the roots and details of contemporary issues faced by our nation and try to locate possible solutions
		CO2	To understand the importance of our surroundings and encourage the students to contribute towards sustainable development
		CO3	To sensitize towards issues related to 'Indian' culture, tradition and its composite character
		CO4	To aware of 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
		CO5	To acquaint with Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

4thYear (7th Semester)

Course Code	Course Name		Course Outcomes (COs) *At the completion of the course, students will be able to:*
KHU701	Rural Development: Administration and Planning	CO1	Students can understand the definitions, concepts and components of Rural Development
		CO2	Students will know the importance, structure, significance, resources of Indian rural economy
		CO3	Students will have a clear idea about the area development programmes and its impact
		CO4	Students will be able to acquire knowledge about rural entrepreneurship
		CO5	Students will be able to 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

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			feasibility report containing technical appraisal
		CO4	Understand project financing
		CO5	Understand social entrepreneurship
KCS071	Artificial Intelligence	CO1	Understand the basics of the theory and practice of Artificial Intelligence as a discipline and about intelligent agents
		CO2	Understand search techniques and gaming theory
		CO3	The student will learn to apply knowledge representation techniques and problem-solving strategies to common AI applications
		CO4	Student should be aware of techniques used for classification and clustering
		CO5	Student should aware of basics of pattern recognition and steps required for it
KCS072	Natural Language Processing	CO1	To learn the fundamentals of natural language processing
		CO2	To understand the use of CFG and PCFG in NLP
		CO3	To understand the role of semantics of sentences and pragmatic
		CO4	To introduce speech production and related parameters of speech
		CO5	To show the computation and use of techniques such as short time fourier transform, linear predictive coefficients and other coefficients in the analysis of speech
KCS073	High Performance Computing	CO1	Able to understand the basic concept of Computer architecture and Modern Processor
		CO2	Able to understand the basic concepts of access optimization and parallel computers
		CO3	Able to describe different parallel processing platforms involved in achieving high performance computing
		CO4	Develop efficient and high performance parallel programming
		CO5	Able to learn parallel programming using message passing paradigm
KCS074	Cryptography & Network Security	CO1	Classify the symmetric encryption techniques and Illustrate various Public key cryptographic techniques
		CO2	Understand security protocols for protecting data on networks and be able to digitally sign emails and files
		CO3	Understand vulnerability assessments and the weakness of using passwords for authentication
		CO4	Be able to perform simple vulnerability assessments and password audits
		CO5	Summarize the intrusion detection and its solutions to overcome the attacks
KCS075	Design &	CO1	Be exposed to technology and business trends impacting

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	Development of Applications		mobile applications
		CO2	Be competent with the characterization and architecture of mobile applications
		CO3	Be competent with understanding enterprise scale requirements of mobile applications
		CO4	Be competent with designing and developing mobile applications using one application development framework
		CO5	Be exposed to Android and iOS platforms to develop the mobile applications
KCS076	**Software Testing**	CO1	Have an ability to apply software testing knowledge and engineering methods
		CO2	Have an ability to design and conduct a software test process for a software testing project
		CO3	Have an ability to identify the needs of software test automation, and define and develop a test tool to support test automation
		CO4	Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods
		CO5	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems
KCS077	**Distributed System**	CO1	To provide hardware and software issues in modern distributed systems
		CO2	To get knowledge in distributed architecture, naming, synchronization, consistency and replication, fault tolerance, security, and distributed file systems
		CO3	To analyze the current popular distributed systems such as peer-to-peer (P2P) systems will also be analyzed
		CO4	To know about Shared Memory Techniques and have Sufficient knowledge about file access
		CO5	Have knowledge of Synchronization and Deadlock
KCS078	**Deep Learning**	CO1	To present the mathematical, statistical and computational challenges of building neural networks
		CO2	To study the concepts of deep learning
		CO3	To introduce dimensionality reduction techniques
		CO4	To enable the students to know deep learning techniques to support real-time applications
		CO5	To examine the case studies of deep learning techniques
KCS079	**Service Oriented Architecture**	CO1	Comprehend the need for SOA and its systematic evolution
		CO2	Apply SOA technologies to enterprise domain
		CO3	Design and analyze various SOA patterns and techniques

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		CO4	Compare and evaluate best strategies and practices of SOA
		CO5	Understand the business case for SOA
KCS710	**Quantum Computing**	CO1	Distinguish problems of different computational complexity and explain why certain problems are rendered tractable by quantum computation with reference to the relevant concepts in quantum theory
		CO2	Demonstrate an understanding of a quantum computing algorithm by simulating it on a classical computer, and state some of the practical challenges in building a quantum computer
		CO3	Contribute to a medium-scale application program as part of a co-operative team, making use of appropriate collaborative development tools (such as version control systems)
		CO4	Produce code and documentation that is comprehensible to a group of different programmers and present the theoretical background and results of a project in written and verbal form
		CO5	Apply knowledge, skills, and understanding in executing a defined project of research, development, or investigation and in identifying and implementing relevant outcomes
KCS711	**Mobile Computing**	CO1	Explain and discuss issues in mobile computing and illustrate overview of wireless telephony and channel allocation in cellular systems
		CO2	Explore the concept of Wireless Networking and Wireless LAN
		CO3	Analyse and comprehend Data management issues like data replication for mobile computers, adaptive clustering for mobile wireless networks and Disconnected operations
		CO4	Identify Mobile computing Agents and state the issues pertaining to security and fault tolerance in mobile computing environment
		CO5	Compare and contrast various routing protocols and will identify and interpret the performance of network systems using Adhoc networks
KCS712	**Internet of Things**	CO1	Demonstrate basic concepts, principles and challenges in IoT
		CO2	Illustrate functioning of hardware devices and sensors used for IoT
		CO3	Analyze network communication aspects and protocols used in IoT
		CO4	Apply IoT for developing real life applications using Ardunio programming
		CO5	To develop IoT infrastructure for popular applications
KCS713	**Cloud**	CO1	Describe architecture and underlying principles of cloud

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	Computing		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
KCS714	Block Chain Architecture Design	CO1	Describe the basic understanding of Blockchain architecture along with its primitive
		CO2	Explain the requirements for basic protocol along with scalability aspects
		CO3	Design and deploy the consensus process using frontend and backend
		CO4	Apply Blockchain techniques for different use cases like Finance, Trade/Supply and Government activities
KCS752	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
		CO5	Learning professional skills like exercising leadership, behaving professionally, behaving ethically, listening effectively, participating as a member of a team, developing appropriate workplace attitudes
KCS753	Project	CO1	Analyze and understand the real-life problem and apply their knowledge to get programming solution
		CO2	Engage in the creative design process through the integration and application of diverse technical knowledge and expertise to meet customer needs and address social issues
		CO3	Use the various tools and techniques, coding practices for developing real life solution to the problem
		CO4	Find out the errors in software solutions and establishing the process to design maintainable software applications
		CO5	Write the report about what they are doing in project and learning the team working skills

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Open Electives II Courses (offered in 7th Semester)

Course Code	Course Name	Course Outcomes (COs) *At the completion of the course, students will be able to:*	
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	Students will be able to understand basic concept of Bioeconomics, challenges, opportunities& regulations
		CO2	Students will be able to understand development and innovation in terms of bioeconomy towards sustainable development
		CO3	Students will be able to understand Inter- and transdisciplinarity in bioeconomy &research approaches
		CO4	Students will be able to 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
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

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4thYear (8th Semester)

Course Code	Course Name	Course Outcomes (COs)	
			At the completion of the course, students will be able to:
KHU801	**Rural Development: Administration and Planning**	CO1	Understand the definitions, concepts and components of rural development
		CO2	Will know the importance, structure, significance, resources of Indian rural economy
		CO3	Will have a clear idea about the area development programmes and its impact
		CO4	Will be able to acquire knowledge about rural entrepreneurship
		CO5	Will be able to understand about the using of different methods for human resource planning
KHU802	**Project Management &Entrepre-neurship**	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
KOE080	**Fundamentals of Drone Technology**	CO1	To design UAV drone system
		CO2	To understand working of different types of engines and its area of applications
		CO3	To understand static and dynamic stability dynamic instability and control concepts
		CO4	To know the loads taken by aircraft and type of construction and also construction materials in them
KCS851	**Project I**	CO1	Analyze and understand the reallife problem and apply their knowledge to get programming solution
		CO2	Engage in the creative design process through the integration and application of diverse technical knowledge and expertise to meet customer needs and address social issues
		CO3	Use the various tools and techniques, coding practices for developing real life solution to the problem
		CO4	Find out the errors in software solutions and establishing the process to design maintainable software applications
		CO5	Write the report about what they are doing in project and learning the team working skills

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Department of Electrical Engineering (EE)

Vision of the Department

To produce globally competent and socially sensitized electrical engineers with strong commitment towards societal development.

Mission of the Department

a. To prepare engineering graduates with sound fundamental knowledge of Electrical Engineering by providing quality education through excellence in teaching-learning blended with practical engineering skills.

b. To provide conductive, academic, and social environment to groom our graduates as socially acceptable citizens.

c. To provide state of art infrastructure and technologies for students to meet the global emerging challenges through collaborations with academia and research organizations and industry-institute relationship.

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Department of Electrical Engineering

Programme: B.Tech. Electrical Engineering

Program Educational Objectives (PEOs)

The PEOs of B.Tech. Electrical Engineering programme are:

1. To train students to apply the acquired knowledge of electrical engineering in its core and allied fields to assimilate, simulate, design, analyze and create solutions and services considering safety, sustainability and cost effectiveness.
2. To encourage the graduates for higher studies to meet the diversified needs of electrical industry, academia and research.
3. To train students of the program in a manner that they should function effectively and ethically in multicultural and multidisciplinary groups practicing electrical engineering profession.

Program Specific Objectives (PSOs)

At the completion of B.Tech Electrical Engineering programme, our:

PSO 1: Graduates will demonstrate their knowledge in effective implementation of electrical engineering fundamentals during practicing their profession with consideration of cultural, social, environmental, and economic factors.

PSO 2: Graduates will be motivated for continuous self-learning in engineering practice and pursue research in advanced areas of electrical engineering and allied domains to offer engineering services to the society, ethically.

Graduate Attributes (GAs)

The graduate attributes for students of Electrical Engineering department are:

- Engineering knowledge
- Problem analysis
- Design/development of solutions
- Conduct investigations of complex problems
- Modern tool usage
- The engineer and society
- Environment and sustainability
- Ethics
- Individual and team work
- Communication
- Project management and finance
- Life-long learning

Program Outcomes (POs)

The outcomes of the program are statements that describe skills that we expect to enable our students to attain by the time of graduation:

No.	Program Outcomes (POs)
PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to

complex engineering activities with an understanding of the limitations.

PO 6 **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10 **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11 **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12 **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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Department of Electrical Engineering

Programme: B.Tech. Electrical Engineering

Course Outcomes (COs)

2nd Year (3rd Semester)

Course Code	Course Name	Course Outcomes (COs) At the completion of the course, students will be able to:	
KOE038	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

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			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
		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	Create a vast know-how of the application of the learning to promote their technical competence
		CO5	Evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics
KVE301	**Universal Human Values**	CO1	Understand value inputs, need, basic guidelines, content and process of value education in current scenario of the society
		CO2	Understand the meaning of Harmony in the Self the Co-existence of Self and Body
		CO3	Understand the value of harmony 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 during work
KEE301	**Electromagnetic Field Theory**	CO1	Apply different coordinate systems and their application in electromagnetic field theory, establish a relation between any two systems and also understand the vector calculus
		CO2	Understand the concept of static electric field. Understand the concept of current and properties of conductors. Establish boundary conditions and to calculate capacitances of different types of capacitors
		CO3	Understand the concept of static magnetic field, magnetic scalar and vector potential
		CO4	Understand the forces due to magnetic field, magnetization, magnetic boundary conditions and inductors
		CO5	Understand displacement current, time varying fields, propagation and reflection of EM waves and transmission lines
KEE302	**Electrical Measurements & Instrumentation**	CO1	Evaluate errors in measurement as well as identify and use different types of instruments for the measurement of voltage, current, power and energy
		CO2	Display the knowledge of measurement of electrical quantities

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			resistance, inductance and capacitance with the help of bridges
		CO3	Demonstrate the working of instrument transformers as well as calculate the errors in current and potential transformers
		CO4	Manifest the working of electronic instruments like voltmeter, multi-meter, frequency meter and CRO
		CO5	Display the knowledge of transducers, their classifications and their applications for the measurement of physical quantities like motion, force, pressure, temperature, flow and liquid level
KEE303	Basic Signals & Systems	CO1	Represent the various types of signals & systems and can perform mathematical operations on them
		CO2	Analyze the response of LTI system to Fourier series and Fourier transform and to evaluate their applications to network analysis
		CO3	Analyze the properties of continuous time signals and system using Laplace transform and determine the response of linear system to known inputs
		CO4	Implement the concepts of Z transform to solve complex engineering problems using difference equations
		CO5	Develop and analyze the concept of state-space models for SISO & MIMO system
KEE351	Analog Electronics Lab	CO1	Understand the characteristics and applications of the Semiconductor devices
		CO2	Draw the characteristics of BJT, FET and MOSFET
		CO3	Understand the parameters of Operational Amplifier and instrumentation Amplifier with their applications
		CO4	Understand the functioning of OP-AMP and design OP-AMP based circuits
		CO5	Understand the V-I characteristics of Power devices like SCR, TRIAC
KEE352	Electrical Measurements and Instrumentation Lab	CO1	Understand the importance of calibration of measuring instruments.
		CO2	Demonstrate the construction and working of different measuring instruments.
		CO3	Demonstrate the construction and working of different AC and DC bridges, along with their applications.
		CO4	Ability to measure electrical engineering parameters like voltage, current, power & phase difference in industry as well as in power generation, transmission and distribution sectors.
		CO5	Capability to analyze and solving the variety of problems in the field of electrical measurements
KEE353	Electrical Workshop	CO1	Perform various types of Electrical connections
		CO2	Develop small circuits on PCB

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		CO3	Differentiate between various electrical wires, cables and accessories.
		CO4	Demonstrate the layout of electrical substation & various safety measures.
KEE354	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 analyze the activities and functions of business professionals
		CO4	Understand and evaluate the areas for future knowledge and skill development
		CO5	Analyze and develop a greater understanding about career options while more clearlydefining 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
KOE034	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

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KOE035	**Basics Data Structure and Algorithms**	CO1	Understand and analyze the time and space complexity of an algorithm
		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	**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	**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

2nd Year (4thSemester)

Course Code	Course Name	Course Outcomes (COs)	
		At the completion of the course, students will be able to:	
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

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		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	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	Create a vast know-how of the application of the learning to promote their technical competence
		CO5	Evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics
KEE401	Digital Electronics	CO1	Apply concepts of Digital Binary System and implementation of Gates
		CO2	Analyze and design of Combinational logic circuits
		CO3	Analyze and design of Sequential logic circuits with their applications
		CO4	Implement the Design procedure of Synchronous & Asynchronous Sequential Circuits
		CO5	Apply the concept of Digital Logic Families with circuit implementation
KEE402	Electrical Machines-I	CO1	Analyze the various principles & concepts involved in Electromechanical Energy conversion

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		CO2	Demonstrate the constructional details of DC machines as well as transformers, and principle of operation of brushless DC motor, Stepper and DC Servo motors
		CO3	Evaluate the performance and characteristics of DC Machine as motor and as well as generator
		CO4	Evaluate the performance of transformers, individually and in parallel operation
		CO5	Demonstrate and perform various connections of three phase transformers
KEE403	Networks Analysis & Synthesis	CO1	Apply the knowledge of basic circuital law, nodal and mesh methods of circuit analysis and simplify the network using Graph Theory approach
		CO2	Analyze the AC and DC circuits using Kirchhoff's law and Network simplification theorems
		CO3	Analyze steady-state responses and transient response of DC and AC circuits using classical and Laplace transform methods
		CO4	Demonstrate the concept of complex frequency and analyze the structure and function of one and two port network. Also evaluate and analysis two-port network parameters
		CO5	Synthesize one port network and analyze different filters
KEE451	Circuit and Simulation Lab	CO1	Apply the knowledge of basic circuital law, nodal and mesh analysis for given circuit
		CO2	Analysis of the AC and DC circuits using simulation techniques
		CO3	Analysis of transient response of AC circuits
		CO4	Evaluation and analysis of two-port network parameters
		CO5	Estimation of parameters of different filters
KEE452	Electrical Machines - I Lab	CO1	Analyze and conduct basic tests on DC Machines and single-phase Transformer
		CO2	Obtain the performance indices using standard analytical as well as graphical methods
		CO3	Determine the magnetization, Load and speed-torque characteristics of DC Machines
		CO4	Demonstrate procedures and analysis techniques to perform electromagnetic and electromechanical tests on electrical machines
KEE453	Digital Electronics Lab	CO1	Understanding of Digital Binary System and implementation of Gates
		CO2	Design the Sequential circuits with the help of combinational circuits and feedback element
		CO3	Design data selector circuits with the help of universal Gates
		CO4	Design the counters with the help of sequential circuit and basic Gates

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		CO5	Implement the projects using the digital ICs and electronics components
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
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
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, 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
KOE045	**Basics Data Structure and Algorithms**	CO1	Understand and analyze the time and space complexity of algorithm
		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
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

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			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
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
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

3rd Year (5th Semester)

Course Code	Course Name	Course Outcomes (COs) At the completion of the course, students will be able to:	
KEE501	Power System – I	CO1	Describe the working principle and basic components of conventional power plants
		CO2	Recognize elements of power system and their functions, as well as compare the different types of supply systems
		CO3	Calculate sag and tension in overhead lines with and without wind and ice loading
		CO4	Understand the effect of earth on capacitance of transmission lines.
		CO5	Elucidate different types of cables and grading of cables
KEE502	Control System	CO1	Identify the basic elements, structures and the characteristics of feedback control systems

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		CO2	Design specification for different control action
		CO3	Analyze the stability of linear time-invariant systems
		CO4	Determine the stability of linear time-invariant systems
		CO5	Design different type of compensators to achieve the desired performance of control System
KEE503	Electrical Machines-II	CO1	Demonstrate the constructional details and principle of operation of three phase Induction and Synchronous Machines.
		CO2	Analyze the performance of the three phase Induction and Synchronous Machines
		CO3	Select appropriate three phase AC machine for any application and appraise its significance
		CO4	Start and observe the various characteristics of three phase Induction & Synchronous Machines
		CO5	Explain the principle of operation and performance of Single-Phase Induction Motor & Universal Motor
KEE051	Robotics	CO1	Learn the basic terminology used in robotics
		CO2	Conceptualize 3-D translation & orientation of robot arm kinematics
		CO3	Understand different robotic actuators and power transmission systems
		CO4	Classify the types of robotic grippers used in automation industries
		CO5	Realization of robotic sensoric system and their interfacing with robot controller
KEE052	Sensors and Transducers	CO1	Understand the working of commonly used sensors in industry for measurement of displacement, force and pressure
		CO2	Recognize the working of commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow and level
		CO3	Identify the application of machine vision
		CO4	Conceptualize signal conditioning and data acquisition methods
		CO5	Comprehend smart sensors and their applications in automation systems
KEE053	Industrial Automation & Control	CO1	Understand the concept of automation, its terminology and basic communication protocol
		CO2	Apply Relay logic for automation
		CO3	Learn about PLC, its operation and application in automation
		CO4	Analyze the industrial sensors, its terminology and how one can interface with PLC
		CO5	Demonstrate Pneumatic system and its application in industry
KEE054	Electrical	CO1	Interpret different National & International Electrical Standards

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	Standards and Engineering Practices		in practice
		CO2	Understand Indian standards for cables, lighting and motors
		CO3	Understand Indian standards of transformers, LV & HV switchgears
		CO4	Demonstrate the basic guidelines for National codes and design practices
		CO5	Select the size and type of transformer, cable & switchgear for electrical applications
KEE055	Optimization Techniques	CO1	Understand the importance of optimization techniques in engineering applications
		CO2	Learn optimization methods for solving linear programming problems
		CO3	Learn optimization methods for solving nonlinear programming problems
		CO4	Be aware of the concept of simulation and modern methods of optimization
		CO5	Apply optimization techniques to electrical engineering problems
KEE056	Neural Networks & Fuzzy Systems	CO1	Apply the concepts of feed forward neural networks and their learning techniques
		CO2	Comprehend the architecture, develop algorithms and apply the concepts of back propagation networks
		CO3	Differentiate between the fuzzy and the crisp sets, apply the concepts of fuzziness and the fuzzy set theory
		CO4	Select the membership functions, write rules and develop the fuzzy controller for Industrial applications
		CO5	Demonstrate the working of fuzzy neural networks and identify its applications
KEE057	Digital Signal Processing	CO1	Represent discrete sequence and LTI systems, frequency domain of discrete sequence. Compute Fourier transform. Draw structure of systems based on System type-IIR & FIR Systems
		CO2	Describe sampling of signal and its reconstruction, processing of continuous time and discrete time signals
		CO3	Evaluate the response of LTI system and rational system function
		CO4	Design IIR & FIR filters with the desired specification with the help of impulse invariant and bilinear transformation method for IIR, with the help of window techniques for FIR. Design Butterworth and Chebyshev filter response
		CO5	Compute DFT using efficient algorithm like FFT in decimation in time and decimation in frequency both, using convolution property and Goertzel algorithm. Comparison between wavelet

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			and Fourier transform. Application of WCT & DCT
KEE058	**Analog & Digital Communication**	CO1	Understand the Amplitude Modulation in communication system
		CO2	Comprehend the Frequency & Phase modulation
		CO3	Realize the Pulse Modulation Techniques
		CO4	Get the Digital Modulation Techniques and their use in communication system
		CO5	Apply the concept of Information Theory in Communication Engineering.
KEE551	**Power System-I Lab**	CO1	Use programming tools /Software: Scilab, MATLAB or any C, C++ - Compiler and formulate a program/simulation model for calculation of various parameters related to transmission line
		CO2	Determine constants for transmission line
		CO3	Simulate the Ferranti & skin effects in transmission line
		CO4	Calculate losses in transmission line
		CO5	Calculate grading & other various parameters for a underground cable
KEE552	**Control System Lab**	CO1	Determine the characteristics of control system components like ac servo motor, synchro, potentiometer, servo voltage stabilizer and use them in error detector mode.
		CO2	Compare the performance of control systems by applying different controllers / compensators
		CO3	Analyze the behavior of dc motor in open loop and closed loop conditions at various loads & determine the response of 1st& 2nd order systems for various values of constant K
		CO4	Apply different stability methods of time & frequency domain in control systems using software & examine their stability
		CO5	Convert the transfer function into state space & vice versa & obtain the time domain response of a second order system for step input and their performance parameters using software.
KEE553	**Electrical Machines-II Lab**	CO1	Perform various tests and demonstrate the various characteristics of three phase induction motor
		CO2	Demonstrate the working of three phase synchronous machine under different operating conditions
		CO3	Evaluate the performance of single-phase induction motor under different operating conditions
		CO4	Develop simulation models for Electrical Machines
KEE554	**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 analyze the activities and functions of business

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			professionals
		CO4	Understand and evaluate the areas for future knowledge and skill development
		CO5	Analyze and develop a greater understanding about career options while more clearlydefining 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	Get basic principles of thought process, reasoning and inference to identify the roots and details of contemporary issues faced by our nation and try to locate possible solutions
		CO2	Understand the importance of our surroundings and encourage the students to contribute towards sustainable development
		CO3	Sensitize towards issues related to 'Indian' culture, tradition and its composite character
		CO4	Aware of 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
		CO5	Acquaint with Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system

3rdYear (6th Semester)

Course Code	Course Name	Course Outcomes (COs) *At the completion of the course, students will be able to:*	
KEE601	**Power System-II**	CO1	Identify power system components on one line diagram of power system and its representation including the behavior of the constituent components and sub systems and Analyse a network under both balanced and unbalanced fault conditions and design the rating of circuit breakers.

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		CO2	Perform load flow analysis of an electrical power network and interpret the results of the analysis
		CO3	Describe the concept of travelling waves in transmission lines and use the travelling wave theory to determine the over voltage caused by surge propagation in transmission networks
		CO4	Assess the steady state and transient stability of the power system under various conditions.
		CO5	Describe Operating Principle of a relay and classify them according to applications. Explain working principle of Circuit breaker and phenomenon of arc production and quenching.
KEE602	Microprocessor and Microcontroller	CO1	Demonstrate the basic architecture of 8085 & 8086 microprocessors
		CO2	Illustrate the programming model of microprocessors & write program using 8085 microprocessor
		CO3	Interface different external peripheral devices with 8085 microprocessor
		CO4	Comprehend the architecture of 8051 microcontroller
		CO5	Compare advance level microprocessor & microcontroller for different applications
KEE603	Power Electronics	CO1	Demonstrate the characteristics as well as the operation of BJT, MOSFET, IGBT, SCR, TRIAC and GTO and identify their use in the power switching applications
		CO2	Comprehend the non-isolated DC-DC converters and apply their use in different Power electronics applications
		CO3	Analyze the phase-controlled rectifiers and evaluate their performance parameters
		CO4	Apprehend the working of single-phase ac voltage controllers, cyclo-converters and their various applications
		CO5	Explain the single-phase and three phase bridge inverters differentiate between CSI and VSI and apply PWM for harmonic reduction
KEE061	Special Electrical Machines	CO1	Describe the working principle, Constructional Features of different types of electrical machines including the fractional kilowatt machines
		CO2	Analyse torque- speed characteristics of different electrical machines and interpret their performance and identify the suitable machine for an operation.
		CO3	Study different types of control techniques for a machine and identify the best control strategy based upon different constraints.
		CO4	Illustrate the use of stepper, BLDCs, SRM, and other special machines in the area of the various industrial and domestic as

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			well as commercial applications of various fractional kilowatt machines.
KEE062	**Electrical Machine Design**	CO1	Classify insulating materials for electrical machines and calculate mmf and magnetizing current
		CO2	Design the core, yoke, windings and the cooling system of a transformer
		CO3	Illustrate the core and armature design of DC and 3-phase synchronous machine. Design of three phase induction motors, field system of DC machine and synchronous machines
		CO5	Analyse computer aided design approaches and apply the concepts of optimization for the design of transformer, dc machine, three phase induction and synchronous machines
KEE063	**Digital Control System**	CO1	Represent discrete time systems under the form of z-domain transfer functions and state-space models
		CO2	Obtain the model of discrete-time systems by pulse transfer function
		CO3	Analyze stability, transient response and steady state behaviour of linear discretetime systems, analytically and numerically using tools such as MATLAB and Simulink
		CO4	Design sampled data control systems
		CO5	Describe Discrete state space model and test controllability and observability of systems
KEE064	**Electrical and Hybrid Vehicles**	CO1	Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources
		CO2	Design and develop basic schemes of electric vehicles and hybrid electric vehicles
		CO3	Choose proper energy storage systems for vehicle applications
		CO5	Identify various communication protocols and technologies used in vehicle networks
KEE651	**Power System-II Lab**	CO1	Test various relays for different characteristics and compare with the performance characteristics provided by manufacturers
		CO2	Select the power system data for load-flow and fault studies and to develop a program to solve power flow problem using NR and GS methods
		CO3	Analyze various types of short circuit faults
		CO4	Demonstrate different numerical integration methods and factors influencing transient stability
		CO5	Determine the effect of load in long transmission line
KEE652	**Microprocessor and Microcontroller**	CO1	Study of microprocessor system
		CO2	Development of flow chart for understanding the data flow
		CO3	Learning assembly language to program microprocessor-based

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	Lab		system
		CO4	Interfacing different peripheral devices with the microprocessor
		CO5	Building logic for microprocessor-based system
KEE653	**Power Electronics Lab**	**CO1**	Demonstrate the characteristics and triggering of IGBT, MOSFET, Power transistor and SCR
		CO2	Analyze the performance of single phase fully controlled bridge rectifiers under different loading conditions
		CO3	Develop simulation models of power electronic circuits
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 Tradition, Cultural and Society**	**CO1**	Get basic principles of thought process, reasoning and inference to identify the roots and details of contemporary issues faced by our nation and try to locate possible solutions
		CO2	Understand the importance of our surroundings and encourage the students to contribute towards sustainable development
		CO3	Sensitize towards issues related to 'Indian' culture, tradition and its composite character
		CO4	Aware of 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
		CO5	Acquaint with Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system
KOE060	**Idea to Business Model**	**CO1**	Enhance creative knowledge of students regarding selection of a business idea and it's 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	Develop knowledge on Production systems and it's sustainability through production, planning and control (PPC)
		CO5	Develop appropriate business model and apply in a better way
KOE061	**Real Time**	**CO1**	Describe concepts of Real-Time systems and modeling

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	Systems	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, Piezoresistance 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
		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

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Course Code	Course Name		
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 the Human Being Comprehensively – Human Aspirations and Its Fulfillment	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	Understand the human tradition and its various components
		CO4	Understand co-existence with other orders
		CO5	Live with harmony from self to entire existence
		CO6	Have clarity about human aspirations, goal, activities and purpose of life

4th Year (7th Semester)

Course Code	Course Name	Course Outcomes (COs)

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			At the completion of the course, students will be able to:
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	Able to acquire knowledge about rural entrepreneurship
		CO5	Able to 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
KEE070	Advanced Micro processors & Micro Controllers	CO1	Explain the Architecture of 8086, memory segmentation and its mode
		CO2	Describe the Instruction set of 8086, and develop various type of programs
		CO3	Illustrate memory interfacing diagram, and explain various type of interfacing
		CO4	Illustrate various modes of processor
		CO5	Explain the architecture of MSP430 and Develop GPIO controlling Program
KEE071	Energy Conservation and Auditing	CO1	Identify and assess the energy conservation/saving opportunities in different electric system and understand related legislations
		CO2	Identify and assess the energy saving behavior of utilities through implementation of DSM and EMIS
		CO3	Explain energy audit & management and to prepare energy audit report for different energy conservation instances
		CO4	Illustrate the energy audit for Mechanical Utilities
		CO5	Describe cost-effective measures towards improving energy efficiency and energy conservation by implementation of energy efficient technologies
KEE072	HVDC & AC Transmission	CO1	Describe the comparison of EHVAC and HVDC transmission while understanding various issues related to transmission
		CO2	Calculate and study the corona loss and its impacts. Cite examples of the causes of switching overvoltage, Ferro-resonance
		CO3	Explain the generation and measurement circuits for impulse,

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			high DC & AC voltages
		CO4	Classify the DC links and choice of converter configuration to investigate the impact of inductance on operation of converters and identify different control schemes as well as starting and stopping methods of DC links
		CO5	Describe the converter faults, protections including MTDC types and applications
KEE073	High Voltage Engineering	CO1	Describe conduction and breakdown phenomenon in gases, liquid dielectrics and solid dielectrics
		CO2	Explain generation of high voltages and currents
		CO3	Explain measurement techniques for high voltages and currents
		CO4	Describe overvoltage phenomenon and insulation coordination in electric power systems
		CO5	Describe non-destructive testing of materials and electric apparatus and high-voltage testing of electric apparatus
KEE074	Power Quality and Facts	CO1	Classify the power quality issues in electrical distribution network
		CO2	Describe the sources of voltage sag and protective devices including voltage regulators, active series compensator and UPS
		CO3	Describe the different phenomenon causing electrical transients and devices for over voltage protection
		CO4	Explain the working and application of different type of FACT devices like SSC, SVC, TSC, SSS, TCSC, UPFC
		CO5	Explain the causes of harmonics, its effect on motor ,capacitor, cables and mitigation techniques
KEE075	Electric Drives	CO1	Describe the operation of electric drives and its classification
		CO2	Explain the electric drive stability and selection of motor power rating
		CO3	Illustrate electric braking and its dynamics
		CO4	Describe the types of DC drives and its control
		CO5	Describe the types of AC drives and its control
KEE076	Power System Dynamics and Control	CO1	Explain the fundamental dynamic behavior and controls of power systems to perform basic stability analysis
		CO2	Describe modeling of Synchronous Machine and per unit quantities-Equivalent circuits
		CO3	Describe modeling of main power system components, such as synchronous machines, excitation systems and calculation of Initial conditions
		CO4	Illustrate Small signal analysis, synchronizing and damping torque analysis

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		CO5	Explain the concept of Power System Stabilizers, Structure & tuning and dynamic compensator analysis
KEE077	**Power System Protection**	CO1	Describe the relays and different protective schemes
		CO2	Explain Relay types and its application
		CO3	Describe types of faults and protection scheme for major components of power system
		CO4	Describe the circuit breaker operation, testing and types.
		CO5	Explain the electronic relay, microprocessor and computer based protection schemes
KEE078	**Deregulated Power System**	CO1	Describe the deregulation, unbundling of electric utilities and its benefits
		CO2	Explain the operational planning activities of independent system operator in pool & bilateral markets and describe competitive bidding
		CO3	Explain the open access of transmission line and management of security & congestion in deregulation
		CO4	Describe the different types of Electric traction, system of track electrification and its related mechanics
		CO5	Illustrate the Reliability Analysis of Generation, transmission and distribution and the regulation of the market
KEE079	**Utilization of Electrical Energy & Electric Traction**	CO1	Describe the methods of electric heating and their advantages
		CO2	Explain the types of Electric welding and the principle of Electro-deposition, laws of electrolysis and its applications
		CO3	Explain the laws of illumination and explain the principle of refrigeration and air-conditioning
		CO4	Describe the different types of Electric traction, system of track electrification and its related mechanics
		CO5	Describe the salient features of traction drive and concept of energy saving using power electronic control of AC and DC drives
KEE751	**Industrial Automation & PLC Lab**	CO1	Understand automation, its importance, expectations from automation andapplications in industry.
		CO2	Understand and analyze the concept of design of PLC based application by proper selectionand sizing criteria, developing GUI and ladder program.
		CO3	Understand the Ladder program for DOL starter, timers, and counters
		CO4	Understand evolution and architecture of DCS, hierarchical control in DCS, programming DCS
		CO5	Explain the concept of basic digital electronics and data manipulation, basic PLC circuits for entry-level PLC applications

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KEE752	**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
		CO5	Learning professional skills like exercising leadership, behaving professionally, behaving ethically, listening effectively, participating as a member of a team, developing appropriate workplace attitudes
KEE753	**Project-I**	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 an oral forms
		CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer

Open Electives II Courses (offered in 7th Semester)

Course Code	Course Name	Course Outcomes (COs)	
		At the completion of the course, students will be able to:	
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.
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 transdisciplinarity in bioeconomy &research approaches
		CO4	Explain biobased resources, value chain, innovative use of biomass

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			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
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

4th Year (8th Semester)

Course Code	Course Name	Course Outcomes (COs)	
		At the completion of the course, students will be able to:	
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	Able to acquire knowledge about rural entrepreneurship
		CO5	Able to understand about the using of different methods for human resource planning
KHU802	Project Management &Entrepreneurship	CO1	Understand need, scope, entrepreneurial competencies & traits
		CO2	Entrepreneurial idea and innovation
		CO3	Understand project appraisal: Preparation of a real time

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			project feasibility report containing technical appraisal
		CO4	Understand project financing
		CO5	Understand social entrepreneurship
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
KOE085	Quality Management	CO1	Know details of Quality Concept, Quality control evaluation
		CO2	Know the insights of quality management
		CO3	Know the details of Control Charts
		CO4	Know the Defects Diagnosis and Prevention
		CO5	Know the detailed standards to maintain quality
KEE851	Project II	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 thecommunity at large in written an oral forms
		CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer

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Department of Mechanical Engineering (ME)

Vision of the Department

To be recognized as an excellent center providing mechanical engineering education, leading to highly competent engineers having professional, ethical and social concerns.

Mission of the Department

a. To impart quality education for thorough knowledge of the domain to our students for enhancing their fundamental skills to make them globally competitive mechanical engineers.

b. To provide state of the art facilities and conducive environment for well grounding our students in the fundamental principles of engineering and preparing them for diverse careers.

c. To strengthen continuing education with special focus on training and skills up gradation of students through institute-industry relationship & collaborations with academia and research organizations.

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Department of Mechanical Engineering

Programme: B.Tech. Mechanical Engineering

Program Educational Objectives (PEOs)

The PEOs of B.Tech. Mechanical Engineering programme are:

1. To prepare students to apply the acquired knowledge of mechanical engineering in its core and allied fields to take industrial problems to create solutions and services considering safety, sustainability and cost effectiveness.
2. To prepare students of the program to be able to function effectively, professionally and ethically in multicultural and multidisciplinary groups practicing engineering by profession.
3. To motivate students to undertake higher studies to meet the diversified requirements of mechanical industry, academia and research.

Program Specific Objectives (PSOs)

At the completion of B.Tech Mechanical Engineering programme, our:

PSO 1: Graduates will be able to apply the acquired theoretical and practical skills to solve the industrial problems of mechanical as well as multidisciplinary nature considering safety, sustainability and cost effectiveness factors.

Graduate Attributes (GAs)

The graduate attributes for students of Mechanical Engineering department are:

- Engineering knowledge
- Problem analysis
- Design/development of solutions
- Conduct investigations of complex problems
- Modern tool usage
- The engineer and society
- Environment and sustainability
- Ethics
- Individual and team work
- Communication
- Project management and finance
- Life-long learning

Program Outcomes (POs)

No.	Program Outcomes (POs)
PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and

responsibilities and norms of the engineering practice.

PO 9   **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10   **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11   **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12   **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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Department of Mechanical Engineering (ME)

Programme: B.Tech. Mechanical Engineering

Course Outcomes (COs)

2nd Year (3rd Semester)

Course Code	Course Name	Course Outcomes (COs)	
		At the completion of the course, students will be able to:	
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	Course Outcomes (COs) At the completion of the course, students will be able to:	
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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Course Code	Course Name		Course Outcomes (COs)
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		Course Outcomes (COs) At the completion of the course, students will be able to:
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	Course Outcomes (COs)		
		At the completion of the course, students will be able to:		
KME601	Refrigeration & Air Conditioning	CO1	Understand the basics 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.

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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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Course Code	Course Name		Course Outcomes (COs)
		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		Course Outcomes (COs) *At the completion of the course, students will be able to:*
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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Course Code	Course Name		
		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 an oral form
		CO5	Demonstrate the knowledge, skills and attitudes of a professional engineer

4th Year (Open Electives II List)

Course Code	Course Name	Course Outcomes (COs) At the completion of the course, students will be able to:	
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 disciplinarity 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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Course Code	Course Name		Course Outcomes
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		Course Outcomes (COs) At the completion of the course, students will be able to:
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	Course Outcomes (COs) At the completion of the course, students will be able to:	
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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		CO2	Know Project identification, field-study and collection of information of projects
		CO3	Know basics of Preparation of balance sheets and assessment of economic viability
		CO4	Know basics of Project Planning and control
		CO5	Know role of various national and state agencies which render assistance to small scale industries.
KOE084	Introduction to Smart Grid	CO1	Understand evaluation and need of smart grid
		CO2	Understand smart grid for Home & Building Automation applications
		CO3	Understand Intelligent Electronic Devices (IED) & their application for monitoring & protection in smart grids
		CO4	Understand Microgrids and Distributed Energy Resources
		CO5	Understand Power Quality Management in Smart Grid
KOE085	Quality Management	CO1	Know details of Quality Concept, Quality control evaluation
		CO2	Know the insights of quality management
		CO3	Know the details of Control Charts
		CO4	Know the Defects Diagnosis and Prevention
		CO5	Know the detailed standards to maintain quality
KOE086	Industrial Optimization Techniques	CO1	Understand the Historical development of optimization & its engineering applications
		CO2	Understand the concept of sequencing and network analysis
		CO3	Understand the concept of 'Theory of Games' and Queueing Models
		CO4	Understand the basics of Dynamic Programming and Simulation
		CO5	Know the concept of Deterministic and probabilistic (nondeterministic) inventory models and their application in engineering
KOE087	Virology	CO1	Learn molecular virology by general principles as opposed to describing each virus family
		CO2	Know the details of Consequences of virus infection to animals and human.
		CO3	Understand the Classification of viruses and concerned nomenclatures
		CO4	Know about Retroviruses: HIV, viral pathogenesis & AIDS.
		CO5	Know about the Modern approaches of virus control
KOE089	Human Values in Madhyasth Darshan	CO1	Know about Madhyasth Darshan and its Basics
		CO2	Know about the general direction and process of evolution in the nature/ existence.
		CO3	Understand the theory revealing Human Being as an indivisible part of Nature
		CO4	Understand about Fulfillment of human goal of realization and prosperity
		CO5	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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Department of Applied Sciences & Humanities (ASH)

Vision of Department

A department recognized for providing quality education and all-round development to students to facilitate various programmes running in college to attain their programme outcomes through effective linkage with first-year development.

Mission of Department

To pursue excellence in imparting quality education in basic engineering, basic sciences and humanities with special focus on development of communication skills, social responsibility and ethical values in students.

Course Outcomes (COs) of all Common Courses (Offered in 1st Year of all B.Tech Programmes)

1st Year (1st Semester)

2020-21 (Odd Semester)

Course Code	Course Name		Course Outcomes (COs) *At the completion of the course, students will be able to:*
KAS101T	**Engineering Physics**	CO1	Solve the classical and wave mechanics problems
		CO2	Develop the understanding of laws of thermodynamics and their application in various processes
		CO3	Formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
		CO4	Aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams
		CO5	Aware about details of Fibre Optics & Laser
KAS102T	**Engineering Chemistry**	CO1	Use of different analytical instruments
		CO2	Measure molecular/ system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.

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		CO3	Measure hardness of water.
		CO4	Estimate the rate constant of reaction
		CO5	Aware about general methods of synthesis of organo metallic compounds (Grignard reagent) and their applications
KAS103T	**Engineering Mathematics-I**	CO1	Remember the concept of matrices and apply for solving linear simultaneous equations
		CO2	Understand the concept of limit, continuity and differentiability and apply in the study of Rolle's, Lagrange's and Cauchy mean value theorem and Leibnitz theorems
		CO3	Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
		CO4	Illustrate the working methods of multiple integral and apply for finding area, volume, center of mass and center of gravity
		CO5	Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume
KEE101T	**Basic Electrical Engineering**	CO1	Apply the concepts of KVL/KCL and network theorems in solving DC circuits
		CO2	Analyze the steady state behavior of single phase and three phase AC electrical circuits
		CO3	Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three-phase transformer
		CO4	Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications
		CO5	Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption
KEC101T	**Emerging Domain in Electronics Engineering**	CO1	Understand the concept of PN Junction and devices
		CO2	Understand the concept of BJT, FET and MOFET
		CO3	Understand the concept of Operational amplifier
		CO4	Understand the concept of measurement instrument
		CO5	Understand the working principle of different type of sensor and their uses
KCS101T	**Programming for Problem Solving**	CO1	Develop simple algorithms for arithmetic and logical problems
		CO2	Translate the algorithms to programs & execution (in C language)
		CO3	Implement conditional branching, iteration and recursion
		CO4	Decompose a problem into functions and synthesize a complete program using divide and conquer approach
		CO5	Use arrays, pointers and structures to develop algorithms and programs
KME101T	**Fundamentals of Mechanical Engineering & Mechatronics**	CO1	Understand the concept of stress and strain, factor of safety, beams
		CO2	Understand the basic component and working of internal combustion engines, electric and hybrid vehicles, refrigerator and heat pump, air conditioning

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		CO3	Understand fluid properties, conservation laws, hydraulic machinery used in real life
		CO4	Understand the working principle of different measuring instrument with the knowledge of accuracy, error and calibration, limit, fit, tolerance and control system
		CO5	Understand concept of mechatronics with their advantages, scope and Industrial application, the different types of mechanical actuation system, the different types of hydraulic and pneumatic systems
KAS151P	Engineering Physics Lab	CO1	Determine the wavelength of sodium light by Newton's ring experiment
		CO2	Determine the wavelength of sodium light with the help of Fresnel's bi-prism.
		CO3	Determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil
		CO4	Draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
		CO5	Measure high resistance by leakage method
KAS152P	Engineering Chemistry Lab	CO1	Use of different analytical instruments.
		CO2	Measure molecular/system properties such as surface tension, viscosity
		CO3	Measure conductance of solution, chloride and iron content in water, hardness of water
		CO4	Estimate the rate constant of reaction
		CO5	Verify the Beer's law
KEE151P	Basic Electrical Engineering Lab	CO1	Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits
		CO2	Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits
		CO3	Perform experiment illustrating BH curve of magnetic materials
		CO4	Calculate efficiency of a single-phase transformer and DC machine
		CO5	Perform experiments on speed measurement and reversal of direction of three phase induction motor and identify the type of DC and AC machines based on their construction
KEC151P	Electronics Engineering Lab	CO1	Know various types of Active & Passive Components based on their ratings
		CO2	Identify various types of Printed Circuit Boards (PCB) and soldering Techniques
		CO3	Characterize the PN Junction diode
		CO4	Understand Operational Amplifier as Adder and Subtractor
		CO5	Implement of the given Boolean function using logic gates in both SOP and POS forms.
KCS151P	Programming for Problem Solving Lab	CO1	Implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems
		CO2	Demonstrate an understanding of computer programming

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			language concepts
		CO3	Design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage
		CO4	Define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures
		CO5	Develop confidence for self-education and ability for life-long learning needed for Computer language
KAS154P	**English Language Lab**	CO1	Understand the basic objective of the course by being acquainted with specific dimensions of communication skills i.e Reading, Writing, Listening, Thinking and Speaking.
		CO2	Create substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
		CO3	Apply it at their work place for writing purposes such as Presentation/official drafting/ administrative communication and use it for document/ project/ report/ research paper writing
		CO4	Evaluate the correct and error-free writing by being well-versed in rules of English grammar and cultivate relevant technical style of communication &presentation at their work place and also for academic uses
		CO5	Apply it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics.
KCE151P	**Engineering Graphics & Design Lab**	CO1	Understand the visual aspects of engineering design
		CO2	Understand the engineering graphics standards and solid modelling
		CO3	Have effective communication through graphics
		CO4	Applying modern engineering tools necessary for engineering practice
		CO5	Appling computer-aided geometric design
KWS151P	**Mechanical Workshop Lab**	CO1	Use various engineering materials, tools, machines and measuring equipments
		CO2	Perform machine operations in lathe and CNC machine
		CO3	Perform manufacturing operations on components in fitting and carpentry shop
		CO4	Perform operations in welding, moulding, casting and gas cutting
		CO5	Fabricate a job by 3D printing manufacturing technique
KMC101	**Artificial Intelligence (AI) For Engineering**	CO1	Understand the evolution and various approaches of AI
		CO2	Understand data storage, processing, visualization, and its use in regression, clustering etc.
		CO3	Understand natural language processing and chatbots
		CO4	Understand the concepts of neural networks
		CO5	Understand the concepts of face, object, speech recognition and robots
KMC102	**Emerging Technology for**	CO1	Understand the concepts of internet of things, smart cities and industrial internet of things

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Course Code	Course Name		Course Outcomes (COs)
	Engineering	CO2	Understand the concepts of cloud computing
		CO3	Understand the concepts of block chain, cryptocurrencies, smart contracts
		CO4	Understand design principles, tools, trends in 3 D printing and drones
		CO5	Understand augmented reality (AR), virtual reality (VR), 5G technology, brain computer interface and human brain
KNC101	**Soft Skills-I**	CO1	Understand the correct usage of grammar.
		CO2	Apply the fundamental inputs of communication skills in making speech delivery, individual conference, and group communication
		CO3	Evaluate the impact of interpersonal communication on their performance as a professional and in obtaining professional excellence at the workplace
		CO4	Skills and techniques of persuasion and negotiation would enhance the level of students at multifarious administrative and managerial platforms
		CO5	Equip with basics of communication skills and will apply it for practical and oral purposes by being honed up in presentation skills and voice-dynamics

2020-21 (Even Semester)

Course Code	Course Name		Course Outcomes (COs) *At the completion of the course, students will be able to:*
KAS201T	**Engineering Physics**	CO1	Solve the classical and wave mechanics problems
		CO2	Develop the understanding of laws of thermodynamics and their application in various processes
		CO3	Formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
		CO4	Aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams
		CO5	Aware about details of Fibre Optics & Laser
KAS202T	**Engineering Chemistry**	CO1	Use of different analytical instruments
		CO2	Measure molecular/ system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
		CO3	Measure hardness of water.
		CO4	Estimate the rate constant of reaction
		CO5	Aware about general methods of synthesis of organo metallic compounds (Grignard reagent) and their applications
KAS203T	**Engineering Mathematics-II**	CO1	Understand the concept of differentiation and apply for solving differential equations
		CO2	Remember the concept of definite integral and apply for evaluating surface areas and volumes.
		CO3	Understand the concept of convergence of sequence and series.

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			Also evaluate Fourier series.
		CO4	Illustrate the working methods of complex functions and apply for finding analytic functions
		CO5	Apply the concept of complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals
KEE201T	**Basic Electrical Engineering**	CO1	Apply the concepts of KVL/KCL and network theorems in solving DC circuits
		CO2	Analyze the steady state behavior of single phase and three phase AC electrical circuits
		CO3	Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three-phase transformer
		CO4	Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications
		CO5	Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption
KEC201T	**Emerging Domain in Electronics Engineering**	CO1	Understand the concept of PN Junction and devices
		CO2	Understand the concept of BJT, FET and MOFET
		CO3	Understand the concept of Operational amplifier
		CO4	Understand the concept of measurement instrument
		CO5	Understand the working principle of different type of sensor and their uses
KCS201T	**Programming for Problem Solving**	CO1	Develop simple algorithms for arithmetic and logical problems
		CO2	Translate the algorithms to programs & execution (in C language)
		CO3	Implement conditional branching, iteration and recursion
		CO4	Decompose a problem into functions and synthesize a complete program using divide and conquer approach
		CO5	Use arrays, pointers and structures to develop algorithms and programs
KME201T	**Fundamentals of Mechanical Engineering & Mechatronics**	CO1	Understand the concept of stress and strain, factor of safety, beams
		CO2	Understand the basic component and working of internal combustion engines, electric and hybrid vehicles, refrigerator and heat pump, air conditioning
		CO3	Understand fluid properties, conservation laws, hydraulic machinery used in real life
		CO4	Understand the working principle of different measuring instrument with the knowledge of accuracy, error and calibration, limit, fit, tolerance and control system
		CO5	Understand concept of mechatronics with their advantages, scope and Industrial application, the different types of mechanical actuation system, the different types of hydraulic and pneumatic systems
KAS251P	**Engineering Physics Lab**	CO1	Determine the wavelength of sodium light by Newton's ring experiment

		CO2	Determine the wavelength of sodium light with the help of Fresnel's bi-prism.
		CO3	Determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil
		CO4	Draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
		CO5	Measure high resistance by leakage method
KAS252P	**Engineering Chemistry Lab**	CO1	Use of different analytical instruments.
		CO2	Measure molecular/system properties such as surface tension, viscosity
		CO3	Measure conductance of solution, chloride and iron content in water, hardness of water
		CO4	Estimate the rate constant of reaction
		CO5	Verify the Beer's law
KEE251P	**Basic Electrical Engineering Lab**	CO1	Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits
		CO2	Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits
		CO3	Perform experiment illustrating BH curve of magnetic materials
		CO4	Calculate efficiency of a single-phase transformer and DC machine
		CO5	Perform experiments on speed measurement and reversal of direction of three phase induction motor and identify the type of DC and AC machines based on their construction
KEC251P	**Electronics Engineering Lab**	CO1	Know various types of Active & Passive Components based on their ratings
		CO2	Identify various types of Printed Circuit Boards (PCB) and soldering Techniques
		CO3	Characterize the PN Junction diode
		CO4	Understand Operational Amplifier as Adder and Subtractor
		CO5	Implement of the given Boolean function using logic gates in both SOP and POS forms.
KCS251P	**Programming for Problem Solving Lab**	CO1	Implement the algorithms and draw flowcharts for solving Mathematical and Engineering problems
		CO2	Demonstrate an understanding of computer programming language concepts
		CO3	Design and develop Computer programs, analyzes, and interprets the concept of pointers, declarations, initialization, operations on pointers and their usage
		CO4	Define data types and use them in simple data processing applications also he/she must be able to use the concept of array of structures
		CO5	Develop confidence for self-education and ability for life-long learning needed for Computer language
KAS254P	**English Language Lab**	CO1	Understand the basic objective of the course by being acquainted with specific dimensions of communication skills i.e Reading,

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			Writing, Listening, Thinking and Speaking.
		CO2	Create substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
		CO3	Apply it at their work place for writing purposes such as Presentation/official drafting/ administrative communication and use it for document/ project/ report/ research paper writing
		CO4	Evaluate the correct and error-free writing by being well-versed in rules of English grammar and cultivate relevant technical style of communication &presentation at their work place and also for academic uses
		CO5	Apply it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics.
KCE251P	**Engineering Graphics & Design Lab**	CO1	Understand the visual aspects of engineering design
		CO2	Understand the engineering graphics standards and solid modelling
		CO3	Have effective communication through graphics
		CO4	Applying modern engineering tools necessary for engineering practice
		CO5	Appling computer-aided geometric design
KWS251P	**Mechanical Workshop Lab**	CO1	Use various engineering materials, tools, machines and measuring equipments
		CO2	Perform machine operations in lathe and CNC machine
		CO3	Perform manufacturing operations on components in fitting and carpentry shop
		CO4	Perform operations in welding, moulding, casting and gas cutting
		CO5	Fabricate a job by 3D printing manufacturing technique
KMC201	**Artificial Intelligence (AI) For Engineering**	CO1	Understand the evolution and various approaches of AI
		CO2	Understand data storage, processing, visualization, and its use in regression, clustering etc.
		CO3	Understand natural language processing and chatbots
		CO4	Understand the concepts of neural networks
		CO5	Understand the concepts of face, object, speech recognition and robots
KMC202	**Emerging Technology for Engineering**	CO1	Understand the concepts of internet of things, smart cities and industrial internet of things
		CO2	Understand the concepts of cloud computing
		CO3	Understand the concepts of block chain, cryptocurrencies, smart contracts
		CO4	Understand design principles, tools, trends in 3 D printing and drones
		CO5	Understand augmented reality (AR), virtual reality (VR), 5G technology, brain computer interface and human brain
KNC201	**Soft Skills-II**	CO1	Converse well with effective LSRW skills in English.
		CO2	Evaluate the importance of conversation in his/her personal and professional domain and apply it for extending their professional frontiers

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		CO3	Apply motivation skills for their individual and professional excellence.
		CO4	Utilize their teamwork and their interpersonal communication skills to survive and excel at their work-place
		CO5	Evaluate creativity for their professional innovation and critical thinking for their competence

2018-19 (Odd Semester)

Course Code	Course Name	Course Outcomes (COs) *At the completion of the course, students will be able to:*	
KAS101	Physics	CO1	Solve the classical and wave mechanics problems
		CO2	Develop the understanding of laws of thermodynamics and their application in various processes
		CO3	Formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
		CO4	Aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams
		CO5	Compare and categorize the Laser and Fiber with losses
KAS151	Physics Lab	CO1	Determine the wavelength of sodium light by Newton's ring experiment
		CO2	Determine the wavelength of sodium light with the help of Fresnel's bi-prism
		CO3	Determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
		CO4	Draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
		CO5	Understand the concept of optical rotation and use it to find the specific rotation of an optically active substance
KAS102	Chemistry	CO1	Use of different analytical instruments
		CO2	Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water
		CO3	Measure hardness of water
		CO4	Estimate the rate constant of reaction
		CO5	Know polymer Chemistry and Organometallic compounds to analyze/infer suitable methods for synthesis and industrial applications
KAS152	Chemistry Lab	CO1	Use of different analytical instruments.
		CO2	Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water
		CO3	Measure hardness of water

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		CO4	Estimate the rate constant of reaction
		CO5	Synthesize Polymers used in daily life
KAS103	**Mathematics-I**	CO1	Remember the concept of matrices and apply for solving linear simultaneous equations.
		CO2	Understand the concept of limit, continuity and differentiability and apply in the study of Rolle's, Lagrange's and Cauchy mean value theorem and Leibnitz theorems
		CO3	Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians
		CO4	Illustrate the working methods of multiple integral and apply for finding area, volume, center of mass and center of gravity
		CO5	Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals
KEE101	**Basic Electrical Engineering**	CO1	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
		CO2	Analyze the steady state behavior of single phase and three phase AC electrical circuits.
		CO3	Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three-phase transformer
		CO4	Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications
		CO5	Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.
KEE151	**Basic Electrical Engineering Laboratory**	CO1	Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
		CO2	Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
		CO3	Perform experiment illustrating BH curve of magnetic materials
		CO4	Calculate efficiency of a single-phase transformer and DC machine
		CO5	Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction
KCS101	**Programming for Problem Solving**	CO1	Develop simple algorithms for arithmetic and logical problems
		CO2	Translate the algorithms to programs & execution (in C language)
		CO3	Implement conditional branching, iteration and recursion
		CO4	Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
		CO5	Use arrays, pointers and structures to develop algorithms and programs
KCS151	**Programming for Problem**	CO1	Write programs for arithmetic and logical problems
		CO2	Translate the algorithms to programs & execution (in C

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	Solving Lab	CO	language)
		CO3	Write programs for conditional branching, iteration and recursion
		CO4	Write programs using functions and synthesize a complete program using divide and conquer approach
		CO5	Write programs using arrays, pointers and structures.
KCE101	Engineering Graphics & Design	CO1	Understand the visual aspects of engineering design
		CO2	Understand engineering graphics standards and solid modelling
		CO3	Effectively communicate through graphics
		CO4	Apply modern engineering tools necessary for engineering practice
		CO5	Apply computer-aided geometric design
KWS101	Workshop Practices	CO1	Study and practice on machine tools and their operations
		CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
		CO3	Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
		CO4	Welding and soldering operations
		CO5	Apply basic electrical engineering knowledge for house wiring practice

2018-19 (Even Semester)

Course Code	Course Name	Course Outcomes (COs) At the completion of the course, students will be able to:	
KAS201	Physics	CO1	Solve the classical and wave mechanics problems
		CO2	Develop the understanding of laws of thermodynamics and their application in various processes
		CO3	Formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
		CO4	Aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams
		CO5	Compare and categorize the Laser and Fiber with losses
KAS251	Physics Lab	CO1	Determine the wavelength of sodium light by Newton's ring experiment
		CO2	Determine the wavelength of sodium light with the help of Fresnel's bi-prism
		CO3	Determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
		CO4	Draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
		CO5	Understand the concept of optical rotation and use it to find the specific rotation of an optically active substance
KAS202	Chemistry	CO1	Use of different analytical instruments
		CO2	Measure molecular/system properties such as surface tension,

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			viscosity, conductance of solution, chloride and iron content in water
		CO3	Measure hardness of water
		CO4	Estimate the rate constant of reaction
		CO5	Know polymer Chemistry and Organometallic compounds to analyze/infer suitable methods for synthesis and industrial applications
KAS252	**Chemistry Lab**	CO1	Use of different analytical instruments.
		CO2	Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water
		CO3	Measure hardness of water
		CO4	Estimate the rate constant of reaction
		CO5	Synthesize Polymers used in daily life
KAS203	**Mathematics-II**	CO1	Understand the concept of differentiation and apply for solving differential equations
		CO2	Remember the concept of definite integral and apply for evaluating surface areas and volumes
		CO3	Understand the concept of convergence of sequence and series. Also evaluate Fourier series
		CO4	Illustrate the working methods of complex functions and apply for finding analytic functions
		CO5	Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals
KEE201	**Basic Electrical Engineering**	CO1	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
		CO2	Analyze the steady state behavior of single phase and three phase AC electrical circuits.
		CO3	Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three-phase transformer
		CO4	Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications
		CO5	Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.
KEE251	**Basic Electrical Engineering Lab**	CO1	Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
		CO2	Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
		CO3	Perform experiment illustrating BH curve of magnetic materials
		CO4	Calculate efficiency of a single-phase transformer and DC machine
		CO5	Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction

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KCS201	**Programming for Problem Solving**	CO1	Develop simple algorithms for arithmetic and logical problems
		CO2	Translate the algorithms to programs & execution (in C language).
		CO3	Implement conditional branching, iteration and recursion
		CO4	Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
		CO5	Use arrays, pointers and structures to develop algorithms and programs
KCS251	**Programming for Problem Solving Lab**	CO1	Write programs for arithmetic and logical problems
		CO2	Translate the algorithms to programs & execution (in C language)
		CO3	Write programs for conditional branching, iteration and recursion
		CO4	Write programs using functions and synthesize a complete program using divide and conquer approach
		CO5	Write programs using arrays, pointers and structures.
KCE201	**Engineering Graphics & Design**	CO1	Understand the visual aspects of engineering design
		CO2	Understand engineering graphics standards and solid modelling
		CO3	Effectively communicate through graphics
		CO4	Apply modern engineering tools necessary for engineering practice
		CO5	Apply computer-aided geometric design
KWS201	**Workshop Practices**	CO1	Study and practice on machine tools and their operations
		CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
		CO3	Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
		CO4	Welding and soldering operations
		CO5	Apply basic electrical engineering knowledge for house wiring practice
KAS204	**Professional English**	CO1	Understand the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.
		CO2	Create substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
		CO3	Apply it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.
		CO4	Evaluate the correct & error-free writing by being well versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.
		CO5	Apply it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics

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