Shobhit University
EDUCATION EMPOWERS

Babu Vijendra Marg, Adarsh Institutional
Area Gangoh, Distt. Saharanpur (U.P.)
247341, India
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School of Engineering and Technology

Bachelor of Technology (Computer Science & Engineering)

Program Outcomes, Program Specific Outcomes & Course Outcomes
(POs, PSOs & COs)

Program Outcomes

Program Outcome		Statement
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, 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.

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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.

Program Specific Outcomes (PSOs)

Program Specific Outcome	Statement
PSO 1.	Software Design and Development Equip students with the necessary skills to design, develop, and deploy software systems and applications, applying software engineering principles, algorithms, and best practices to solve complex problems efficiently
PSO 2.	System Design and Networking Develop students' ability to design, implement, and analyze computer systems, networks, and databases, with a focus on optimization, scalability, and security in distributed computing environments.
PSO 3.	Emerging Technologies and Innovation Encourage students to explore and apply emerging technologies such as Artificial Intelligence, Machine Learning, Cloud Computing, and Internet of Things (IoT), preparing them to innovate and adapt to technological advancements.
PSO 4.	Professionalism and Ethical Responsibility Instill in students the importance of professionalism, ethical conduct, and societal responsibility in their work, ensuring they consider the broader impact of technology on society, privacy, and security.

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Course Outcomes (COs)

1st Semester

Course: Mathematics-I

Course Outcomes	Statement
CO 1	Apply matrix algebra techniques to solve linear equations, calculate eigenvalues and eigenvectors, and understand matrix diagonalization.
CO 2	Solve linear and simultaneous differential equations using various analytical methods like Euler-Cauchy and variation of parameters.
CO 3	Implement numerical methods to solve ordinary differential equations and analyze the convergence of infinite series.
CO 4	Evaluate functions of several variables, apply the chain rule, and find extrema using Taylor's theorem and Jacobians.
CO 5	Solve second-order differential equations using series methods and understand the properties of Bessel functions and Legendre polynomials

Course: Mathematics

Course Outcomes	Statement
CO 1	Apply basic mathematical principles to real-world problems.
CO 2	Develop problem-solving techniques using algebra and calculus.
CO 3	Utilize theorems and formulas to solve mathematical problems.
CO 4	Analyze data with statistical and probabilistic methods.
CO 5	Use mathematical software for complex problem-solving and visualization.

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Course: Basic Mathematics

Course Outcomes	Statement
CO 1	Understand fundamental mathematical operations and principles.
CO 2	Solve basic algebraic equations and expressions.
CO 3	Perform arithmetic calculations with accuracy.
CO 4	Interpret and solve simple geometric problems.
CO 5	Apply basic mathematical concepts to everyday situations.

Course: Applied Mathematics

Course Outcomes	Statement
CO 1	Apply mathematical methods to solve real-world engineering problems.
CO 2	Use differential equations to model and analyze dynamic systems.
CO 3	Implement optimization techniques for resource allocation and decision-making.
CO 4	Apply numerical methods to solve complex mathematical problems.
CO 5	Utilize statistical tools to analyze and interpret data in applied contexts.

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Course: Advanced Applied Mathematics

Course Outcomes	Statement
CO 1	Solve complex partial differential equations in physical and engineering problems.
CO 2	Apply advanced numerical methods for simulations and approximations.
CO 3	Model and analyze systems using advanced optimization techniques.
CO 4	Use advanced statistical methods for data analysis and prediction.
CO 5	Implement mathematical theories in the analysis of complex real-world scenarios.

Course: Engineering Mechanics

Course Outcomes	Statement
CO 1	Understanding of basic concepts in two-dimensional force systems and their application in analyzing concurrent and non-concurrent forces.
CO 2	Ability to determine shear force and bending moment diagrams for statically determinate beams and analyze simple trusses using joint and section methods.
CO 3	Knowledge of stress and strain, including the effects of normal and shear stresses, strain energy, and bending in beams and torsion in circular sections.
CO 4	Proficiency in calculating centroids, moments of inertia for plane areas, and using theorems for composite bodies and mass moment of inertia.
CO 5	Understanding of key thermodynamic principles such as laws of thermodynamics, entropy, and the Carnot cycle, along with their applications in energy analysis.

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Course: Structural Analysis

Course Outcomes	Statement
CO 1	Analyze forces and moments in static structures.
CO 2	Apply principles of equilibrium to solve structural problems.
CO 3	Calculate deformations and displacements in structures.
CO 4	Evaluate the stability and strength of structures under various loads.
CO 5	Use advanced methods for analyzing complex structural systems.

Course: Rigid Body Mechanics

Course Outcomes	Statement
CO 1	Apply the principles of force and motion to rigid body systems.
CO 2	Analyze the equilibrium of rigid bodies under applied forces and moments.
CO 3	Solve problems involving the kinematics and kinetics of rigid bodies.
CO 4	Use the concepts of angular velocity and acceleration in rigid body motion.
CO 5	Apply energy methods to analyze work and power in rigid body systems.

Course: Fluid Mechanics

Course Outcomes	Statement
CO 1	Understand the properties and behavior of fluids at rest and in motion.
CO 2	Apply principles of fluid statics and dynamics to solve engineering problems.
CO 3	Analyze fluid flow using Bernoulli's equation and conservation laws.
CO 4	Study the effects of viscosity and turbulence on fluid flow.
CO 5	Use dimensional analysis to solve and scale fluid mechanics problems.

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Course: Free-Body Diagrams Mechanics

Course Outcomes	Statement
CO 1	Identify and represent forces acting on a body in a free-body diagram.
CO 2	Apply equilibrium conditions to solve for unknown forces and moments.
CO 3	Understand the role of support reactions and external loads in a system.
CO 4	Analyze structures by breaking them down into individual components.
CO 5	Use free-body diagrams to visualize and solve static and dynamic problems.

Course: Fundamentals of Electronics

Course Outcomes	Statement
CO 1	Describe the concept of PN Junction and devices.
CO 2	Explain the concept of BJT, FET and MOFET.
CO 3	Apply the concept of Operational amplifier to design linear and non-linear applications.
CO 4	Perform number systems conversions, binary arithmetic and minimize logic functions.
CO 5	Describe the fundamentals of communication technologies.

Course: Analog Electronics

Course Outcomes	Statement
CO 1	Analyze and design basic analog circuits using resistors, capacitors, and inductors.
CO 2	Understand the operation of diodes, transistors, and operational amplifiers in analog circuits.
CO 3	Apply filtering techniques in analog signal processing.
CO 4	Design and analyze amplifiers for various applications.
CO 5	Use frequency response analysis to understand circuit behavior in the frequency domain.

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Course: Digital Electronics

Course Outcomes	Statement
CO 1	Understand the principles of binary systems and digital logic.
CO 2	Design and analyze combinational and sequential logic circuits.
CO 3	Apply Boolean algebra to simplify digital circuits.
CO 4	Implement digital circuits using gates, flip-flops, and registers.
CO 5	Use counters and shift registers in digital systems for data storage and processing.

Course: Electronics Measurement and Testing

Course Outcomes	Statement
CO 1	Use various electronic instruments to measure voltage, current, and resistance.
CO 2	Calibrate and test electronic components for proper functionality.
CO 3	Understand the principles of oscilloscopes, multimeters, and signal generators.
CO 4	Perform frequency analysis and signal waveform testing.
CO 5	Analyze and troubleshoot electronic circuits using measurement tools.

Course: Electromagnetics

Course Outcomes	Statement
CO 1	Understand the principles of electric fields, magnetic fields, and their interactions.
CO 2	Analyze electromagnetic waves and their propagation in different media.
CO 3	Apply Maxwell's equations to solve electromagnetic problems.
CO 4	Study the behavior of waveguides and antennas in communication systems.
CO 5	Use computational methods to model and solve electromagnetic field problems.

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Course: Engineering Chemistry and Environmental Studies

Course Outcomes	Statement
CO 1	Understanding of different fuel types, their calorific value, and methods of determining the calorific value of coal, biomass, biogas, and biodiesel.
CO 2	Knowledge of polymer types, polymerization processes, and applications of plastics, rubbers, and bio-polymers, including their degradation and vulcanization processes.
CO 3	Proficiency in water hardness types, associated problems in boilers, and various water softening methods like Permutit, De-ionization, and Lime-soda processes.
CO 4	Awareness of environmental pollution types, their impact on air, water, soil, and human health, including greenhouse effects and water contamination issues.
CO 5	Familiarity with pollution control and cleanup methods, including air and water pollution prevention, solid waste management, and bioremediation techniques like phytoremediation.

Course: Chemical Thermodynamics

Course Outcomes	Statement
CO 1	Understand the laws of thermodynamics and their application in chemical processes.
CO 2	Analyze energy changes in chemical reactions using enthalpy, entropy, and Gibbs free energy.
CO 3	Apply the concept of equilibrium to chemical reactions and phase transitions.
CO 4	Calculate the work, heat, and efficiency in thermodynamic cycles.
CO 5	Use thermodynamic principles to predict the spontaneity and direction of chemical reactions.

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Course: Chemical Kinetics

Course Outcomes	Statement
CO 1	Understand the rate laws and factors affecting reaction rates.
CO 2	Analyze reaction mechanisms and determine rate-determining steps.
CO 3	Apply the Arrhenius equation to study temperature dependence of reaction rates.
CO 4	Determine the effect of concentration, temperature, and catalysts on reaction rates.
CO 5	Use integrated rate laws to calculate concentration changes over time in chemical reactions.

Course: Environmental Chemistry

Course Outcomes	Statement
CO 1	Understand the chemical processes occurring in the environment.
CO 2	Analyze the impact of pollutants on air, water, and soil quality.
CO 3	Study the chemistry of natural cycles, such as carbon, nitrogen, and sulfur cycles.
CO 4	Investigate the sources, behavior, and fate of hazardous chemicals in the environment.
CO 5	Apply chemical principles to develop strategies for pollution control and sustainable practices.

Course: Natural Resource Management

Course Outcomes	Statement
CO 1	Understand the principles of sustainable management of natural resources.
CO 2	Analyze the impact of human activities on natural ecosystems and biodiversity.
CO 3	Develop strategies for the conservation and efficient use of water, soil, and energy resources.
CO 4	Apply environmental policies and regulations to manage natural resources effectively.
CO 5	Use modern technologies to monitor and assess natural resource availability and health.

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Course: Presentation and communication skills

Course Outcomes	Statement
CO 1	Mastery of essential grammar rules, sentence structures, and correct usage of word classes, articles, tenses, and prepositions.
CO 2	Expanded vocabulary through synonyms, antonyms, idioms, one-word substitutes, and technical terms, with focus on word formation using prefixes and suffixes.
CO 3	Enhanced linguistic skills through active listening, speaking, reading, and writing activities, including phonetics and reading comprehension techniques.
CO 4	In-depth understanding of language through literature, with analysis of essays, poems, and plays from authors like Bacon, Lamb, Keats, and Tagore.
CO 5	Development of professional speaking skills for job interviews, group discussions, public speaking, and presentations, with emphasis on body language and argumentative skills.

Course: English Communication

Course Outcomes	Statement
CO 1	Develop effective verbal and written communication skills in various contexts.
CO 2	Enhance listening skills to understand and respond appropriately in conversations.
CO 3	Use appropriate vocabulary, grammar, and sentence structures for clear communication.
CO 4	Improve presentation skills for conveying ideas confidently and clearly.
CO 5	Foster interpersonal communication skills for better collaboration and teamwork.

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Course: English

Course Outcomes	Statement
CO 1	Improve reading comprehension and critical analysis of texts.
CO 2	Enhance writing skills for clear and coherent expression of ideas.
CO 3	Develop vocabulary and grammar for effective communication.
CO 4	Practice spoken English for better fluency and pronunciation.
CO 5	Analyze literary works to understand themes, characters, and contexts.

Course: Technical Communication

Course Outcomes	Statement
CO 1	Develop clear and concise technical writing skills for manuals and reports.
CO 2	Enhance the ability to present technical information to diverse audiences.
CO 3	Use proper documentation techniques for technical processes and systems.
CO 4	Improve oral communication skills for effective presentations and discussions.
CO 5	Master the use of visuals and diagrams to support technical explanations.

Course: Human Values, Deaddiction and Traffic Rules

Course Outcomes	Statement
CO 1	Understand and apply ethical principles and human values in personal and professional life.
CO 2	Promote awareness and practices to prevent addiction and its harmful effects.
CO 3	Develop a sense of responsibility toward maintaining traffic safety and following traffic rules.
CO 4	Foster respect for others' rights and well-being in society.
CO 5	Encourage active participation in community efforts to enhance road safety and reduce substance abuse.

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Course: Road Safety and Traffic Management

Course Outcomes	Statement
CO 1	Understand the principles of road safety and its importance in preventing accidents.
CO 2	Learn traffic rules and regulations to ensure safe driving and pedestrian practices.
CO 3	Analyze traffic flow and apply management techniques for smoother transportation.
CO 4	Develop strategies for reducing congestion and improving road infrastructure.
CO 5	Promote public awareness and education on safe road behavior and accident prevention.

Course: Engineering Workshop Practice

Course Outcomes	Statement
CO 1	Study and practice on machine tools and their operations
CO 2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
CO 3	Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
CO 4	Welding and soldering operations
CO 5	Apply basic electrical engineering knowledge for house wiring practice

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Course: Engineering Graphics Lab

Course Outcomes	Statement
CO 1	Develop skills in creating accurate technical drawings using drafting tools.
CO 2	Understand and apply basic geometric principles in design and construction.
CO 3	Create 2D and 3D representations of engineering objects and structures.
CO 4	Use computer-aided design (CAD) software to produce and modify technical drawings.
CO 5	Interpret and analyze engineering drawings for practical application in projects.

Course: Communication Lab

Course Outcomes	Statement
CO 1	Improve verbal communication skills through practice in discussions and presentations.
CO 2	Enhance listening skills for better comprehension and response.
CO 3	Develop effective public speaking techniques for clear and confident delivery.
CO 4	Practice writing skills for creating concise and well-structured documents.
CO 5	Foster teamwork and interpersonal communication through group activities and exercises.

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Course: English Communication Lab

Course Outcomes	Statement
CO 1	Improve pronunciation and fluency in spoken English through interactive sessions.
CO 2	Develop listening skills for better understanding of various English accents.
CO 3	Enhance vocabulary and grammar for effective written and oral communication.
CO 4	Practice group discussions and debates to build confidence in public speaking.
CO 5	Learn to write clear, concise, and structured texts for different communication contexts.

Course: English Lab

Course Outcomes	Statement
CO 1	Improve reading comprehension and interpretive skills through various texts.
CO 2	Enhance vocabulary and grammar usage for effective communication.
CO 3	Develop writing skills for essays, reports, and creative content.
CO 4	Practice listening skills through audio materials and discussions.
CO 5	Strengthen speaking skills through role-plays, debates, and presentations.

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Course: Technical Communication Lab

Course Outcomes	Statement
CO 1	Develop technical writing skills for creating manuals, reports, and documentation.
CO 2	Enhance presentation skills for delivering technical information clearly and confidently.
CO 3	Improve the ability to communicate complex technical concepts to diverse audiences.
CO 4	Practice creating and interpreting technical diagrams and visuals to support communication.
CO 5	Foster collaboration and teamwork through group technical projects and discussions.

Course: Human Values, Deaddiction And Traffic Rules (Lab)

Course Outcomes	Statement
CO 1	Understand the importance of human values in personal and professional life.
CO 2	Raise awareness about the dangers of addiction and promote preventive measures.
CO 3	Learn and practice traffic rules for ensuring road safety and discipline.
CO 4	Develop a sense of responsibility and ethical behavior in daily activities.
CO 5	Encourage active participation in community efforts to promote de-addiction and road safety.

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Course Outcomes (COs)
2nd Semester

Course: Mathematics-II

Course Outcomes	Statement
CO 1	Students will be able to evaluate double and triple integrals and apply them to compute areas and volumes in different coordinate systems.
CO 2	Graduates will demonstrate the ability to use vector differentiation concepts such as Gradient, Divergence, and Curl and apply fundamental vector calculus theorems in real-world applications.
CO 3	Learners will acquire a strong understanding of Fourier Series and Fourier Transforms, enabling them to analyze periodic functions and signals effectively.
CO 4	Students will be equipped with Laplace Transform techniques to solve linear differential equations and engineering-related problems efficiently.
CO 5	Graduates will be capable of applying Z-Transforms to solve difference equations, which are crucial for discrete-time systems and digital signal processing.

Course: Differential Equations

Course Outcomes	Statement
CO 1	Solve ordinary differential equations (ODEs) using analytical and numerical methods.
CO 2	Apply techniques like separation of variables and integrating factors to solve first-order ODEs.
CO 3	Analyze and solve higher-order linear differential equations with constant coefficients.
CO 4	Use methods like variation of parameters and undetermined coefficients for solving non-homogeneous ODEs.
CO 5	Model real-world phenomena and systems using differential equations in various fields.

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Course: Probability and Statistics

Course Outcomes	Statement
CO 1	Understand the fundamentals of probability theory and random variables.
CO 2	Apply statistical methods to analyze and interpret data sets.
CO 3	Use probability distributions (normal, binomial, etc.) to model real-world scenarios.
CO 4	Apply hypothesis testing and confidence intervals to make data-driven decisions.
CO 5	Utilize statistical tools for regression analysis and correlation to understand relationships in data.

Course: Mathematical Logic

Course Outcomes	Statement
CO 1	Understand the basic principles of mathematical logic, including propositions and logical connectives.
CO 2	Apply truth tables to analyze logical statements and determine their validity.
CO 3	Study and use logical inference rules for constructing valid arguments.
CO 4	Analyze set theory concepts and their relation to logical reasoning.
CO 5	Solve problems using logical quantifiers, such as "for all" and "there exists."

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Course: Differential Geometry

Course Outcomes	Statement
CO 1	Understand the basic concepts of curves, surfaces, and manifolds in differential geometry.
CO 2	Apply techniques like curvature and torsion to study the geometry of curves.
CO 3	Analyze the properties of surfaces using concepts such as geodesics and normal vectors.
CO 4	Explore the relationship between geometry and topology in higher-dimensional spaces.
CO 5	Use differential equations to model and understand geometric structures and transformations.

Course: Engineering Physics

Course Outcomes	Statement
CO 1	Understand the concepts of quantum physics for materials.
CO 2	Use of equipment for low and high energy applications.
CO 3	Solve engineering problems by applying the concepts of wave and particle nature of radiant energy.
CO 4	Apply the concept of energy band for semiconductors.
CO 5	Construct a quantum mechanical model to explain the behavior of a system at microscopic level.

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Course: Classical Mechanics

Course Outcomes	Statement
CO 1	Understand the fundamental principles of motion, forces, and energy in classical systems.
CO 2	Apply Newton's laws to solve problems involving force and acceleration.
CO 3	Analyze the dynamics of rigid bodies and systems using concepts like torque and angular momentum.
CO 4	Study the behavior of oscillating systems and solve problems in harmonic motion.
CO 5	Use Lagrangian and Hamiltonian mechanics to solve complex mechanical problems.

Course: Electromagnetic Theory

Course Outcomes	Statement
CO 1	Understand the basic concepts of electric and magnetic fields and their interactions.
CO 2	Apply Maxwell's equations to describe electromagnetic wave propagation.
CO 3	Analyze the behavior of electromagnetic waves in different media and boundary conditions.
CO 4	Study electromagnetic radiation and its applications in communication systems.
CO 5	Solve problems involving electromagnetic induction, waveguides, and antennas.

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Course: Quantum Mechanics

Course Outcomes	Statement
CO 1	Understand the fundamental principles of quantum theory, including wave-particle duality and uncertainty.
CO 2	Apply Schrödinger's equation to solve problems in quantum systems.
CO 3	Analyze quantum states, wave functions, and probability distributions.
CO 4	Study the behavior of particles in potential wells, barriers, and harmonic oscillators.
CO 5	Explore quantum phenomena like superposition, entanglement, and tunneling.

Course: Solid State Physics

Course Outcomes	Statement
CO 1	Understand the crystal structure and properties of solids, including lattice and symmetry.
CO 2	Analyze the electrical, thermal, and magnetic properties of materials at the atomic level.
CO 3	Study the behavior of electrons in solids using concepts like band theory and energy bands.
CO 4	Explore the phenomena of superconductivity and magnetism in solid materials.
CO 5	Apply principles of solid-state physics to understand semiconductor devices and their applications.

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Course: Computer Fundamentals and Programming Using C

Course Outcomes	Statement
CO 1	Understanding of computer systems, hardware organization, and components such as CPU, memory, and I/O devices, along with basic concepts of assemblers, compilers, and linkers.
CO 2	Proficiency in number systems, binary arithmetic, and data representation techniques, including ASCII code and BCD, along with foundational knowledge of operating systems and algorithms.
CO 3	Ability to write and execute basic C programs, understand syntax errors, and apply arithmetic expressions, operators, and precedence in C programming.
CO 4	Knowledge of conditional branching, loops, and iteration using if, switch, while, for, and do-while statements, along with function definitions and recursion.
CO 5	Proficiency in handling arrays, strings, structures, pointers, and dynamic memory allocation, along with file I/O operations in C programming.

Course: Basic Electrical Engineering

Course Outcomes	Statement
CO 1	Understanding of network fundamentals, circuit analysis techniques, and application of network theorems such as Thevenin's, Norton's, and Superposition.
CO 2	Proficiency in analyzing steady-state single-phase AC circuits, resonance, power calculations, and three-phase balanced circuits.
CO 3	Knowledge of transformer principles, construction, losses, and efficiency, along with magnetic circuit calculations.
CO 4	Familiarity with the operation and construction of DC machines, single-phase motors, induction motors, and synchronous generators.
CO 5	Ability to measure electrical quantities using moving iron instruments, understand electrical installations, and apply safety measures like earthing and lightning protection.

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Course: Circuit Theory

Course Outcomes	Statement
CO 1	Understand the fundamental laws of electrical circuits, including Ohm's law and Kirchhoff's laws.
CO 2	Analyze resistive, capacitive, and inductive circuits using both steady-state and transient methods.
CO 3	Apply network theorems such as Thevenin's, Norton's, and Superposition Theorem to simplify circuits.
CO 4	Study AC and DC circuits, including the concepts of impedance, reactance, and power.
CO 5	Solve complex circuits using techniques like mesh analysis, nodal analysis, and phasor diagrams.

Course: Electromagnetism

Course Outcomes	Statement
CO 1	Understand the fundamental concepts of electric and magnetic fields and their interactions.
CO 2	Apply Maxwell's equations to solve problems involving static and dynamic fields.
CO 3	Study electromagnetic wave propagation and its relationship with light.
CO 4	Analyze the behavior of materials in electric and magnetic fields, including dielectric and magnetic properties.
CO 5	Use the concepts of electromagnetism in practical applications like electrical circuits and communication systems.

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Course: Digital Electronics

Course Outcomes	Statement
CO 1	Understand the fundamentals of binary systems and logic gates.
CO 2	Design and analyze combinational and sequential logic circuits.
CO 3	Apply Boolean algebra to simplify and optimize digital circuits.
CO 4	Use flip-flops, registers, and counters for data storage and control in digital systems.
CO 5	Implement digital systems using multiplexers, decoders, and encoders for various applications.

Course: Electrical Measurements And Instrumentation

Course Outcomes	Statement
CO 1	Understand the principles and working of electrical measuring instruments.
CO 2	Calibrate and use instruments to measure voltage, current, resistance, and power.
CO 3	Analyze the accuracy, precision, and limitations of different measurement techniques.
CO 4	Apply analog and digital instrumentation in electrical system diagnostics.
CO 5	Use oscilloscopes, millimeters, and signal generators for electrical testing and analysis.

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Course: Technical Communication

Course Outcomes	Statement
CO 1	Develop interpersonal communication, small group interactions and public speaking.
CO 2	Exercise the writing assignments, precise writing for informational, persuasive and creative purposes.
CO 3	Apply right form of structural usage of sentences in their written and oral communication.
CO 4	Develop confidence and skills related reading comprehension.
CO 5	Improve a logical framework for the critical analysis of spoken, written, visual and mediated messages upon a diverse platforms.

Course: Business Communication

Course Outcomes	Statement
CO 1	Develop effective written communication skills for business correspondence and reports.
CO 2	Enhance verbal communication skills for professional presentations and meetings.
CO 3	Understand the principles of business etiquette and professional interaction.
CO 4	Improve listening skills for better understanding and response in business contexts.
CO 5	Learn to use visual aids and data effectively in business communication.

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Course: Presentation Skills

Course Outcomes	Statement
CO 1	Develop the ability to organize and structure content for clear and engaging presentations.
CO 2	Enhance verbal and non-verbal communication skills to effectively engage an audience.
CO 3	Use visual aids and multimedia tools to support and enhance the presentation.
CO 4	Build confidence in delivering presentations in front of diverse audiences.
CO 5	Practice handling questions and discussions to effectively interact with the audience.

Course: Digital Communication

Course Outcomes	Statement
CO 1	Understand the principles of digital communication systems and data transmission.
CO 2	Analyze modulation techniques like AM, FM, and PM for effective signal transmission.
CO 3	Study error detection and correction methods to improve communication reliability.
CO 4	Explore digital encoding and decoding techniques for efficient data representation.
CO 5	Apply concepts of bandwidth, noise, and channel capacity in designing communication systems.

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Course: Audience Analysis

Course Outcomes	Statement
CO 1	Understand the importance of identifying the needs, interests, and characteristics of an audience.
CO 2	Analyze audience demographics such as age, education, and cultural background to tailor communication.
CO 3	Assess the knowledge level of the audience to ensure appropriate content complexity.
CO 4	Develop strategies for engaging and maintaining the audience's attention during presentations.
CO 5	Adapt communication style and tone based on audience feedback and responses.

Course: Engineering Physics Lab

Course Outcomes	Statement
CO 1	Perform experiments to understand the fundamental concepts of physics in engineering applications.
CO 2	Use instruments to measure physical properties such as length, time, and temperature accurately.
CO 3	Analyze experimental data to verify theoretical predictions and principles.
CO 4	Develop practical skills in handling equipment and conducting laboratory procedures.
CO 5	Prepare clear and concise lab reports to document findings and conclusions.

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Course: Classical Mechanics Lab

Course Outcomes	Statement
CO 1	Conduct experiments to verify the principles of motion, force, and energy in classical systems.
CO 2	Measure and analyze parameters like velocity, acceleration, and displacement in mechanical setups.
CO 3	Apply Newton's laws and other classical mechanics concepts to solve practical problems.
CO 4	Develop skills in using mechanical instruments to observe and record physical phenomena.
CO 5	Document experimental results and analyze them to draw conclusions related to classical mechanics.

Course: Electromagnetic Theory Lab

Course Outcomes	Statement
CO 1	Perform experiments to verify the principles of electric and magnetic fields.
CO 2	Measure the properties of electromagnetic waves and analyze their behavior in different media.
CO 3	Apply Maxwell's equations to real-world electromagnetic problems and scenarios.
CO 4	Use instruments like oscilloscopes and signal generators to study electromagnetic phenomena.
CO 5	Analyze experimental data to understand the relationship between electric fields, magnetic fields, and wave propagation.

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Course: Quantum Mechanics Lab

Course Outcomes	Statement
CO 1	Conduct experiments to verify principles of quantum mechanics, such as wave-particle duality.
CO 2	Measure quantum effects like interference and diffraction in particle behavior.
CO 3	Use laboratory tools to observe and analyze quantum phenomena, such as energy levels and transitions.
CO 4	Apply the concepts of superposition and entanglement in practical setups.
CO 5	Analyze experimental data to explore the validity of quantum mechanical models and theories.

Course: Solid State Physics Lab

Course Outcomes	Statement
CO 1	Conduct experiments to study the electrical and thermal properties of solid materials.
CO 2	Measure the band gap and conductivity of semiconductors and insulators.
CO 3	Analyze the magnetic properties of materials and their response to external fields.
CO 4	Investigate the crystal structure and symmetry of solids using diffraction techniques.
CO 5	Apply solid-state physics principles to study phenomena like superconductivity and magnetism in materials.

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Course: Computer Programming Using C Lab

Course Outcomes	Statement
CO 1	Develop programming skills using C for solving computational problems.
CO 2	Write, compile, and debug C programs to implement algorithms and data structures.
CO 3	Understand memory management concepts such as pointers, arrays, and dynamic memory allocation.
CO 4	Apply control structures like loops, conditionals, and functions in C programming.
CO 5	Implement file handling and develop practical applications using C programming concepts.

Course: Basic Electrical Engineering Lab

Course Outcomes	Statement
CO 1	Conduct experiments to understand the basic principles of electrical circuits and components.
CO 2	Measure and analyze electrical quantities like voltage, current, and resistance using appropriate instruments.
CO 3	Study the characteristics and operation of electrical devices like resistors, capacitors, and inductors.
CO 4	Apply Ohm's law and Kirchhoff's laws to solve basic electrical circuit problems.
CO 5	Develop skills in wiring and testing electrical circuits safely in a laboratory environment.

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Course: Circuit Theory Lab

Course Outcomes	Statement
CO 1	Perform experiments to verify circuit theorems such as Ohm's law and Kirchhoff's laws.
CO 2	Measure and analyze the voltage, current, and power in various electrical circuits.
CO 3	Study the behavior of passive and active components like resistors, capacitors, and transistors.
CO 4	Use tools like oscilloscopes and multimeters to test and troubleshoot circuits.
CO 5	Develop practical skills in constructing, simulating, and analyzing electrical circuits.

Course: Electromagnetism Lab

Course Outcomes	Statement
CO 1	Conduct experiments to study the properties of electric and magnetic fields.
CO 2	Measure and analyze the behavior of electromagnetic waves in different materials.
CO 3	Verify the principles of electromagnetic induction and Faraday's law.
CO 4	Use instruments like galvanometers and oscilloscopes to observe electromagnetic phenomena.
CO 5	Apply Maxwell's equations to practical problems involving electric and magnetic fields.

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Course: Digital Electronics Lab

Course Outcomes	Statement
CO 1	Design and implement basic digital circuits using logic gates and flip-flops.
CO 2	Verify and analyze the functionality of combinational and sequential logic circuits.
CO 3	Use simulation tools and hardware to test and troubleshoot digital circuits.
CO 4	Develop skills in using digital ICs, multiplexers, decoders, and counters.
CO 5	Apply Boolean algebra to simplify and optimize digital circuit designs.

Course: Electrical Measurements and Instrumentation Lab

Course Outcomes	Statement
CO 1	Use various electrical instruments to measure voltage, current, resistance, and power.
CO 2	Calibrate and test measuring devices for accuracy and precision.
CO 3	Analyze the working principles of analog and digital measurement instruments.
CO 4	Conduct experiments to understand the characteristics of sensors and transducers.
CO 5	Develop skills in data acquisition and analysis for electrical measurements.

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Course Outcomes (COs)

3rd Semester

Course: Data structure using 'C'

Course Outcomes	Statement
CO 1	Understanding basic data structures like arrays, linked lists, and their operations, including dynamic and array-based implementations, and applications like sparse matrices and polynomial addition.
CO 2	Proficiency in stack and queue operations, including their array and linked implementations, and understanding their applications in recursion, postfix expressions, and simulation.
CO 3	Knowledge of trees, including binary trees, tree traversals, binary search trees, heaps, AVL trees, and m-way search trees, with an emphasis on insertion, deletion, and traversal algorithms.
CO 4	Familiarity with graph representations, graph traversal techniques (DFS, BFS), and algorithms for spanning trees, shortest paths, and minimum cost spanning trees like Prim's and Kruskal's.
CO 5	Ability to perform search operations (sequential, binary) and sorting algorithms (insertion, quicksort, heap sort, etc.), analyze their complexities, and implement hashing techniques with collision resolution strategies.

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Course: Database Management System

Course Outcomes	Statement
CO 1	Understanding of database management systems, data models, ER diagrams, and the process of transforming ER diagrams into relational tables.
CO 2	Proficiency in the relational data model, SQL commands, and operations such as queries, joins, subqueries, and aggregate functions.
CO 3	Knowledge of database design, normalization techniques, functional dependencies, and normal forms including BCNF for efficient database structuring.
CO 4	Familiarity with transaction processing concepts, including serializability, conflict resolution, recovery methods, and deadlock handling in databases.
CO 5	Understanding of concurrency control, recovery systems, file organization, and indexing techniques such as B+ trees and dynamic hashing for efficient data storage and retrieval.

Course: Java Programming

Course Outcomes	Statement
CO 1	Write Java programs with properly designed constants, variables, objects, methods and reusability functionality
CO 2	Learn how and where to implement interface and exception-handling concepts.
CO 3	Write multi-threaded programming concepts for concurrency control-based applications.
CO 4	Construct GUI based JAVA enterprise applications
CO 5	Develop web applications using JDBC, RMI and Servlet methodologies.

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Course: Operating Systems

Course Outcomes	Statement
CO 1	Understanding of operating system objectives, evolution, services, and system calls, along with user-interface interactions.
CO 2	Knowledge of process management, CPU scheduling algorithms, process synchronization issues, and solutions like semaphores and classic synchronization problems.
CO 3	Proficiency in memory management concepts, virtual memory, page replacement algorithms, and handling issues like thrashing and segmentation.
CO 4	Familiarity with I/O systems, mass storage structures, disk scheduling algorithms, and the kernel I/O subsystem's role in transforming requests into hardware operations.
CO 5	Understanding of deadlock characterization, prevention, avoidance, and detection techniques, as well as system protection methods and access control mechanisms.

Course: Discrete Mathematics

Course Outcomes	Statement
CO 1	Understanding of set theory, relations, and functions, along with theorem proving techniques like induction and the pigeonhole principle.
CO 2	Proficiency in propositional logic, truth tables, logical implications, and quantifiers, alongside fundamental concepts in probability and random variables.
CO 3	Knowledge of posets, Hasse diagrams, lattices, Boolean algebra, and applications of permutations, combinations, and recurrence relations.
CO 4	Familiarity with algebraic structures, including groups, rings, fields, divisibility, congruences, and their properties and operations.
CO 5	Ability to analyze graphs and combinatorics concepts, including graph representations, tree properties, and algorithms like Euler and Hamiltonian paths.

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Course: Value Education, Human Rights and Legislative Procedure

Course Outcomes	Statement
CO 1	Understanding of human values, value education, and their role in personal development, including self-analysis and sensitization towards gender equality and respect for others.
CO 2	Knowledge of national and global values, including democracy, equality, justice, professionalism, and religious and aesthetic values, promoting national integration and international understanding.
CO 3	Awareness of environmental conservation, ecological balance, and the interdependence of all living and non-living beings.
CO 4	Familiarity with therapeutic measures such as physical exercise, meditation, yoga, and methods to control desires, anger, and worries for mental and physical well-being.
CO 5	Understanding of human rights from both Indian and international perspectives, including rights for women and children, and the role of institutions in protecting and enforcing these rights.

Course: Humanities and Science

Course Outcomes	Statement
CO 1	Understand the fundamental concepts of humanities and their relation to science and technology.
CO 2	Develop critical thinking and analytical skills through the study of literature, history, and social sciences.
CO 3	Explore the ethical implications of scientific advancements and technological innovations.
CO 4	Enhance communication skills by integrating scientific and humanistic perspectives.
CO 5	Apply interdisciplinary knowledge to address real-world issues and promote societal development.

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Course: Public Policy

Course Outcomes	Statement
CO 1	Understand the principles and processes of public policy formulation and implementation.
CO 2	Analyze the role of government, institutions, and stakeholders in shaping public policy.
CO 3	Examine the impact of policies on society, economy, and environment.
CO 4	Develop skills in evaluating and assessing policy effectiveness and outcomes.
CO 5	Explore the ethical and legal considerations involved in public policy decisions.

Course: Leaders for Global Operations

Course Outcomes	Statement
CO 1	Understand the principles of global operations and the challenges faced by leaders in an international context.
CO 2	Develop strategic thinking and decision-making skills for managing global supply chains and operations.
CO 3	Analyze the impact of cultural, economic, and political factors on global business operations.
CO 4	Foster leadership skills to drive innovation, efficiency, and sustainability in global organizations.
CO 5	Learn to navigate global markets, manage cross-cultural teams, and lead change in a dynamic environment.

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Course: Perl Programming

Course Outcomes	Statement
CO 1	To identify basic perl constructs and to outline perl debugging commands.
CO 2	To create and design simple perl programs with the available perl
CO 3	To pre-defined functions.
CO 4	To demonstrate perl subroutines and perl references
CO 5	To Apply Data Structures on perl programs and perl formats.

Course: Introduction to Soft Computing

Course Outcomes	Statement
CO 1	Understanding the concept of soft computing, its characteristics, and its applications compared to hard computing.
CO 2	Knowledge of fuzzy logic, fuzzy sets, operations, decision-making, and the design and applications of fuzzy logic controllers in electrical engineering.
CO 3	Familiarity with neural networks, including supervised and unsupervised learning, perceptrons, backpropagation, and their applications in electrical engineering control problems.
CO 4	Proficiency in optimization techniques like genetic algorithms, evolutionary algorithms, simulated annealing, and ant colony optimization for solving electrical engineering problems.
CO 5	Ability to apply soft computing techniques in practical electrical engineering problems, focusing on control, modeling, and optimization.

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Course: Mathematics

Course Outcomes	Statement
CO 1	Develop problem-solving skills using mathematical concepts and techniques.
CO 2	Apply mathematical methods to solve real-world engineering and scientific problems.
CO 3	Understand and work with algebra, calculus, probability, and statistics.
CO 4	Enhance logical thinking and analytical skills through mathematical reasoning.
CO 5	Use mathematical tools for modeling and analyzing complex systems and data.

Course: Basic Mathematics

Course Outcomes	Statement
CO 1	Understand fundamental mathematical concepts such as arithmetic, algebra, and geometry.
CO 2	Develop problem-solving skills through basic equations and functions.
CO 3	Apply mathematical principles to solve real-world problems in various fields.
CO 4	Enhance understanding of fractions, percentages, ratios, and proportions.
CO 5	Learn basic statistics and probability to interpret and analyze data.

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Course: Mathematics-I

Course Outcomes	Statement
CO 1	Understand the fundamental concepts of calculus, including limits, derivatives, and integrals.
CO 2	Apply differentiation and integration techniques to solve problems in physics and engineering.
CO 3	Analyze functions and their behavior using graphical and algebraic methods.
CO 4	Solve problems involving sequences, series, and their convergence.
CO 5	Learn methods to solve ordinary differential equations and apply them to real-world scenarios.

Course: Advanced Applied Mathematics

Course Outcomes	Statement
CO 1	Apply advanced techniques in calculus and linear algebra to solve complex mathematical problems.
CO 2	Use partial differential equations to model and analyze physical phenomena.
CO 3	Study vector calculus and its application in fields like electromagnetism and fluid dynamics.
CO 4	Explore advanced numerical methods for solving large-scale engineering and scientific problems.
CO 5	Develop mathematical models to analyze and optimize systems in various disciplines like economics and biology.

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Course: MATLAB Programming For Engineers

Course Outcomes	Statement
CO 1	Develop proficiency in using MATLAB for solving engineering problems and simulations.
CO 2	Implement algorithms and functions to perform numerical analysis and data visualization.
CO 3	Apply MATLAB for solving linear algebra, calculus, and differential equations in engineering contexts.
CO 4	Use MATLAB to model and simulate real-world systems and analyze their behavior.
CO 5	Develop skills in writing efficient code for engineering applications and problem-solving.

Course: Data Structure Using 'C' Lab

Course Outcomes	Statement
CO 1	Understand and implement linear data structures such as arrays, stacks, queues, and linked lists.
CO 2	Apply non-linear data structures like binary search trees and heaps for efficient data management and retrieval.
CO 3	Represent and traverse graphs using adjacency lists and matrices, implementing DFS and BFS.
CO 4	Develop and compare basic sorting algorithms for organizing data effectively.
CO 5	Apply hashing techniques to create efficient lookup structures using collision handling methods.

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Course: Dbms Lab

Course Outcomes	Statement
CO 1	Understand and use SQL, SQL*Plus, and perform basic database operations.
CO 2	Design and manage databases using E-R diagrams, normalization, and key constraints.
CO 3	Implement and manage tables, views, indexes, and use aggregate functions for data analysis.
CO 4	Develop and troubleshoot PL/SQL programs with exception handling, triggers, and cursors.
CO 5	Create and manage subprograms, including procedures and functions, for effective database operations.

Course: Java Programming Lab

Course Outcomes	Statement
CO 1	Develop foundational programming skills by implementing basic operations, such as printing, calculations, and string manipulations.
CO 2	Implement and understand fundamental data structures including arrays, linked lists, stacks, queues, and binary trees.
CO 3	Apply various sorting algorithms (bubble sort, selection sort, and insertion sort) and search techniques (linear and binary search).
CO 4	Work with file handling and HashMap for storing and managing data efficiently.
CO 5	Gain proficiency in recursion, iterative solutions, and algorithm design for solving mathematical and data structure problems.

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Course Outcomes (COs)
4th Semester

Course: Object Oriented Programming Using C++

Course Outcomes	Statement
CO 1	Understand OOPS Concepts: Students will comprehend the fundamental principles of OOPS, including encapsulation, abstraction, inheritance, polymorphism, and composition.
CO 2	C++ Programming Skills: Students will learn to apply OOPS concepts using the C++ programming language.
CO 3	Classes and Objects: Students will define classes and objects, understand their properties and methods, and use them effectively.
CO 4	Inheritance and Polymorphism: Students will grasp inheritance and polymorphism, using them to create more flexible and reusable code.
CO 5	Code Quality and Maintenance: Students will understand the importance of code quality and maintenance, using OOPS principles to create high-quality code.

Course: Design and Analysis of Algorithm

Course Outcomes	Statement
CO 1	Understand the fundamentals of algorithms, including characteristics, performance analysis, and asymptotic notations like Big-O, Omega, and Theta.
CO 2	Gain knowledge of divide and conquer strategies, with applications to binary search, quick sort, merge sort, and graph algorithms.
CO 3	Learn the greedy method and its applications in problems like job sequencing, knapsack, and minimum cost spanning trees.
CO 4	Explore graph algorithms such as BFS, DFS, spanning trees, and dynamic programming applications like optimal binary search trees and the traveling salesperson problem.
CO 5	Understand backtracking, branch and bound techniques, and NP-hard/NPC problems, including their impact on algorithm complexity and solution approaches.

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Course: Internet and Web Technology

Course Outcomes	Statement
CO 1	Understand web technologies, protocols, and the process of creating websites for individuals and businesses.
CO 2	Gain knowledge of HTML, including text formatting, graphics, tables, and creating forms and links.
CO 3	Learn how to use CSS for styling web pages, including font, text, and background attributes, and creating navigation links.
CO 4	Understand JavaScript fundamentals like variables, functions, loops, events, and how to integrate JavaScript with HTML for interactive web pages.
CO 5	Explore PHP syntax, working with forms, processing data, and handling error and exceptions in web development.

Course: Computer Networks

Course Outcomes	Statement
CO 1	Understand the history, structure, and goals of computer networks, including OSI and TCP/IP models and network topologies.
CO 2	Learn about data link layer protocols, error control, and media access techniques like CSMA, FDMA, and CDMA.
CO 3	Gain knowledge of network layer routing algorithms, IP addressing, and congestion control mechanisms in TCP/IP networks.
CO 4	Explore transport and session layer issues, remote procedure calls, and presentation layer techniques like compression and cryptography.
CO 5	Study application layer protocols, including HTTP, email protocols, DNS, and file transfer methods in computer networks.

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Course: Formal Languages & Automation Theory

Course Outcomes	Statement
CO 1	Apply the knowledge of automata theory, grammars & regular expressions for solving the problem.
CO 2	Analyze the give automata, regular expression & grammar to know the language it represents.
CO 3	Design Automata & Grammar for pattern recognition and syntax checking.
CO 4	Distinguish between decidability and un-decidability of problems.
CO 5	Identify limitations of some computational models and possible methods of proving them.

Course: Nano Sciences

Course Outcomes	Statement
CO 1	Understand the fundamental concepts and principles of nanoscience and nanotechnology.
CO 2	Explore the physical, chemical, and biological properties of materials at the nanoscale.
CO 3	Study various synthesis and characterization techniques for nanomaterials.
CO 4	Analyze the applications of nanomaterials in fields like electronics, medicine, and energy.
CO 5	Evaluate the environmental, ethical, and safety issues related to nanotechnology.

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Course: Technical English

Course Outcomes	Statement
CO 1	Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers.
CO 2	Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.
CO 3	Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience.
CO 4	Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence.
CO 5	It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics.

Course: Business Communication

Course Outcomes	Statement
CO 1	Develop clear and concise written communication skills for business contexts.
CO 2	Enhance verbal communication abilities for meetings, presentations, and negotiations.
CO 3	Understand the role of non-verbal cues and professional etiquette in business interactions.
CO 4	Apply communication strategies suited to different business situations and audiences.
CO 5	Use digital tools and formats for effective business correspondence and reporting.

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Course: Technical Writing

Course Outcomes	Statement
CO 1	Develop the ability to write clear, concise, and well-structured technical documents.
CO 2	Understand the principles of audience analysis to tailor content for different readers.
CO 3	Use appropriate formatting and styles for manuals, reports, and technical documentation.
CO 4	Apply proper citation and referencing techniques in technical writing.
CO 5	Enhance skills in presenting complex technical information in an easily understandable manner.

Course: Intercultural Communication

Course Outcomes	Statement
CO 1	Understand the importance of cultural differences in communication styles and practices.
CO 2	Develop skills to effectively communicate across diverse cultural backgrounds.
CO 3	Recognize and navigate language barriers and non-verbal communication cues in intercultural settings.
CO 4	Foster respect and empathy for cultural diversity to improve collaboration and teamwork.
CO 5	Apply intercultural communication strategies in both professional and personal interactions.

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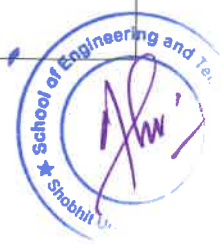
Course: Operations Research

Course Outcomes	Statement
CO 1	Understand the scope and phases of operations research (OR), including linear programming and graphical solutions.
CO 2	Learn the fundamentals of game theory, including zero-sum games, pure and mixed strategies, and saddle point analysis.
CO 3	Explore queuing theory, the dual simplex method, and special cases of linear programming, including duality.
CO 4	Gain knowledge of transportation and assignment problems, and learn the mathematical models and algorithms used to solve them.
CO 5	Study network techniques like shortest path, minimum spanning tree, and max-flow problems, along with project management methods such as CPM and PERT.

Course: Object Oriented Programming Using C++ Lab

Course Outcomes	Statement
CO 1	Develop skills in designing and implementing object-oriented programs using C++.
CO 2	Understand the concepts of classes, objects, inheritance, polymorphism, and encapsulation.
CO 3	Apply C++ features like constructors, destructors, and operator overloading in programming tasks.
CO 4	Practice writing modular and reusable code through the use of functions and classes.
CO 5	Debug, compile, and optimize C++ programs for real-world problem-solving applications.



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Course: Design and Analysis Of Algorithms Lab

Course Outcomes	Statement
CO 1	Understand and implement various algorithms like sorting, searching, and graph traversal.
CO 2	Analyze the time and space complexity of algorithms using Big-O notation.
CO 3	Practice designing efficient algorithms for problem-solving in different contexts.
CO 4	Use data structures such as arrays, linked lists, stacks, and queues in algorithm implementation.
CO 5	Test and debug algorithms to ensure correctness and optimal performance.

Course: Internet and Web Technology Lab

Course Outcomes	Statement
CO 1	Develop practical skills in creating and designing websites using HTML, CSS, and JavaScript.
CO 2	Implement dynamic web pages by integrating client-side and server-side technologies.
CO 3	Understand and apply web protocols like HTTP, FTP, and web services.
CO 4	Explore database integration for web applications using SQL and backend technologies.
CO 5	Learn to troubleshoot and optimize websites for performance and usability.

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Course Outcomes (COs)

5th Semester

Course: Software Engineering

Course Outcomes	Statement
CO 1	Identify appropriate software design model based on requirement analysis.
CO 2	Formulate Software Requirements Specification (SRS) reports for the real world application. 3. Translate a specification into a design and identify the components to build the architecture. 4. Plan a software engineering process to account for quality issues and non-functional requirements.
CO 3	Translate a specification into a design and identify the components to build the architecture.
CO 4	Plan a software engineering process to account for quality issues and non-functional requirements.
CO 5	Estimate the work to be done, resources required and the schedule for a software project plan.

Course: Compiler Design

Course Outcomes	Statement
CO 1	Understand compiler phases, lexical analysis, and the application of finite state machines and regular expressions.
CO 2	Learn parsing techniques, including shift-reduce, operator precedence, and LR parsers, along with the construction of parsing tables.
CO 3	Study syntax-directed translation, intermediate code generation, and translation of different language constructs like assignments and expressions.
CO 4	Explore symbol table management, runtime administration, and error detection/recovery in lexical, syntactic, and semantic phases.
CO 5	Gain knowledge of code generation, optimization techniques, and machine-independent optimizations like loop and global data-flow analysis.

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Course: Object Oriented Analysis and Design

Course Outcomes	Statement
CO 1	Understand object modeling concepts such as classes, inheritance, and aggregation, along with metadata.
CO 2	Learn dynamic modeling, including events, states, and nested state diagrams for advanced dynamic system representation.
CO 3	Explore functional modeling through data flow diagrams and understand OMT methodologies with practical case studies.
CO 4	Gain proficiency in Java programming, including syntax, methods, classes, multithreading, and Java AWT for GUI development.
CO 5	Develop software using Java technologies like Java Beans, Swing, Servlets, JSP, and JDBC, with real-world application examples.

Course: Cryptography and Information Security

Course Outcomes	Statement
CO 1	Understand the principles, approaches, and types of security, including cryptography concepts like encryption, decryption, and symmetric/asymmetric key cryptography.
CO 2	Learn about symmetric key ciphers (DES, AES, RC5) and asymmetric key ciphers (RSA, Diffie-Hellman), along with their operations and use cases.
CO 3	Gain knowledge of cryptographic hash functions, digital signatures, and key management techniques, including Kerberos and X.509 services.
CO 4	Explore transport-level security protocols like SSL/TLS, HTTPS, and SSH, and understand wireless network security considerations and mobile device security.
CO 5	Study email and IP security protocols like PGP, S/MIME, and IPsec, along with real-world cryptography case studies such as secure elections and cross-site scripting.

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Course: Internet Web Programming

Course Outcomes	Statement
CO 1	Understand web development fundamentals, including client-server architecture and the basics of HTTP.
CO 2	Gain proficiency in HTML and CSS for structuring and styling web pages, and learn responsive design principles.
CO 3	Learn JavaScript basics, including variables, functions, and DOM manipulation for interactive web pages.
CO 4	Master advanced JavaScript concepts like asynchronous programming, AJAX, and dynamic content updates.
CO 5	Get introduced to front-end frameworks like React, Angular, or Vue.js for building interactive, component-based web applications.

Course: Graph Theory

Course Outcomes	Statement
CO 1	Understand graph properties, types, and Turan's theorem.
CO 2	Learn about paths, circuits, Euler and Hamiltonian graphs, and various theorems related to graph connectivity.
CO 3	Study trees, spanning trees, shortest path algorithms, and minimal spanning trees like Prim and Kruskal's algorithms.
CO 4	Explore cut sets, planar graphs, dual graphs, and planarity detection.
CO 5	Master graph coloring, chromatic numbers, and directed graphs with algorithms like Warshall's and Bellman-Ford.

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Course: Computer Vision

Course Outcomes	Statement
CO 1	Understand image formation, representation, and transformations in computer vision.
CO 2	Apply image processing techniques such as histogram equalization, convolution, and Fourier transformation for filtering and noise removal.
CO 3	Learn feature detection methods like edge, corner, and line detection, along with advanced descriptors like SIFT and HOG.
CO 4	Explore camera calibration, motion representation, and techniques like optical flow for analyzing motion.
CO 5	Master motion tracking with filters like the Kalman filter and object recognition through appearance-based methods and shape representation.

Course: Robotics And Automation

Course Outcomes	Statement
CO 1	Understand the fundamental concepts, history, and components of robotics and its applications.
CO 2	Learn the principles of robotics kinematics, including forward and inverse kinematics and transformation matrices.
CO 3	Explore robot dynamics through Newton-Euler and Lagrangian methods for dynamic modeling and simulation.
CO 4	Gain knowledge of control systems in robotics, including PID, adaptive, and robust control strategies.
CO 5	Understand the role of sensors, sensor fusion, and perception technologies like vision systems and lidar in robotics.

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Course: Human Computer Interaction

Course Outcomes	Statement
CO 1	Understand the importance and principles of user interface design, focusing on graphical and web-based interfaces.
CO 2	Learn the design process for screen creation, focusing on human interaction, layout, and content organization.
CO 3	Explore the selection and design of windows, navigation schemes, and interface components such as text, icons, and multimedia.
CO 4	Gain knowledge of HCI in the software process, usability engineering, prototyping, and evaluation techniques.
CO 5	Understand cognitive models, ubiquitous computing, augmented reality, and applications in information visualization and user experience.

Course: Cloud Computing

Course Outcomes	Statement
CO 1	Understand the evolution, features, and applications of cloud computing, along with its advantages and limitations.
CO 2	Learn about different cloud models (SaaS, PaaS, IaaS) and their respective characteristics, providers, and services.
CO 3	Gain insights into the advantages and challenges of Platform as a Service (PaaS) and its application frameworks.
CO 4	Understand the architecture, advantages, and challenges of Infrastructure as a Service (IaaS) and cloud-based data storage
CO 5	Understand the evolution, features, and applications of cloud computing, along with its advantages and limitations.

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Course: Energy Studies

Course Outcomes	Statement
CO 1	Understand various energy sources in India, including fossil fuels, nuclear, and renewable energies, and their conservation methods.
CO 2	Learn about the energy conversion processes for solar, nuclear, geothermal, tidal, and wind energies.
CO 3	Explore the global energy scenario, including energy demand, depletion, and international policies of key organizations like G-8 and OPEC.
CO 4	Analyze the Indian energy scenario, examining commercial and noncommercial energy use and sector-wise consumption patterns.
CO 5	Study energy policy issues at global, national, and state levels, focusing on the Energy Conservation Act 2001 and the Electricity Act 2003.

Course: Supply Chain Management

Course Outcomes	Statement
CO 1	Understand the key components and processes involved in supply chain management.
CO 2	Analyze the impact of logistics, inventory, and distribution on business efficiency.
CO 3	Apply optimization techniques to improve supply chain performance.
CO 4	Develop strategies for managing risks and uncertainties in supply chains.
CO 5	Explore the role of technology and software tools in modern supply chain management.

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Course: Transportation

Course Outcomes	Statement
CO 1	Understand the principles of transportation systems and their impact on logistics.
CO 2	Analyze the various modes of transportation and their cost-effectiveness.
CO 3	Study transportation planning and optimization techniques for efficiency.
CO 4	Develop an understanding of traffic management and safety regulations.
CO 5	Apply mathematical models to solve transportation-related problems, such as route optimization.

Course: Environment and Sustainability

Course Outcomes	Statement
CO 1	Study the environmental impact of human activities and industrial practices.
CO 2	Develop sustainable practices for resource utilization and waste management.
CO 3	Analyze the relationship between environmental conservation and economic development.
CO 4	Understand the role of policies and regulations in promoting sustainability.
CO 5	Explore renewable energy solutions and their potential for sustainable development.

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Course: Software Engineering Lab

Course Outcomes	Statement
CO 1	Apply software development life cycle (SDLC) methodologies to build real-world applications.
CO 2	Develop skills in coding, debugging, and testing software systems.
CO 3	Use version control systems like Git to manage code and collaborate on software projects.
CO 4	Implement and test software solutions using different programming languages and frameworks.
CO 5	Analyze software requirements, design, and architecture for scalability and maintainability.

Course: Compiler Design Lab

Course Outcomes	Statement
CO 1	Understand the key components and stages involved in compiler construction.
CO 2	Design lexical analyzers, parsers, and code generators for programming languages.
CO 3	Implement syntax and semantic analysis techniques for efficient compiler development.
CO 4	Explore optimization techniques for generating efficient machine code.
CO 5	Test and debug compilers for handling various programming language constructs.

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Course: Object Oriented Analysis And Design Lab

Course Outcomes	Statement
CO 1	Apply object-oriented design principles to model and analyze complex systems.
CO 2	Use UML diagrams to represent system components, interactions, and workflows.
CO 3	Develop skills in class design, inheritance, polymorphism, and encapsulation.
CO 4	Implement object-oriented concepts using programming languages like Java or C++.
CO 5	Test and validate the functionality of object-oriented systems through practical exercises.

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Course Outcomes (COs)
6th Semester

Course: Computer Graphics

Course Outcomes	Statement
CO 1	Understand the fundamentals of computer graphics, including graphical input/output devices and algorithms for drawing primitives like lines, circles, and polygons.
CO 2	Learn about 2D transformations such as translation, rotation, scaling, and shear, and how to apply composite transformations using homogeneous coordinates.
CO 3	Study 2D viewing and clipping techniques, including window-to-viewport transformation and line and polygon clipping algorithms.
CO 4	Explore 3D transformations, viewing techniques, and projections, along with curve and surface representation methods like Bezier and B-spline curves.
CO 5	Learn about illumination models, visible surface detection methods, and surface rendering techniques, including basic ray tracing algorithms.

Course: Data Warehousing & Data Mining

Course Outcomes	Statement
CO 1	Understand the components and architecture of data warehousing, OLAP, and multidimensional data analysis.
CO 2	Learn the processes involved in data mining, including preprocessing, data cleaning, integration, and transformation, and explore association rule mining.
CO 3	Gain knowledge of classification and prediction techniques such as decision trees, Bayesian classification, SVMs, and performance evaluation metrics.
CO 4	Explore clustering methods, including partitioning, hierarchical, density-based, and grid-based methods, as well as outlier analysis.
CO 5	Study techniques for mining object, spatial, multimedia, text, and web data, along with multidimensional analysis and descriptive mining of complex data objects.

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Course: Mobile Computing

Course Outcomes	Statement
CO 1	Understand the basics of mobile computing, GSM architecture, and its services, including mobile data and security.
CO 2	Gain knowledge of wireless communication evolution, cellular concepts, and techniques for improving coverage and capacity in cellular systems.
CO 3	Learn about mobile radio propagation models, including free space, diffraction, and small-scale multipath fading.
CO 4	Explore medium access control in ad hoc networks, various routing protocols, and quality of service in mobile networks.
CO 5	Study wireless LAN standards like IEEE 802.11, Bluetooth, and mobile IP, along with applications and protocols such as WAP.

Course: Knowledge Management & Expert System

Course Outcomes	Statement
CO 1	Understand the concepts of knowledge creation, intellectual capital, and the transition from information management to knowledge management.
CO 2	Learn about tacit and explicit knowledge, knowledge storage, distribution, and the role of KM tools like data warehouses and data mining.
CO 3	Explore the social nature of knowledge, knowledge sharing obstacles, and organizational learning at individual, group, and organizational levels.
CO 4	Gain knowledge of expert systems, their architecture, and the role of technologies like genetic algorithms, fuzzy logic, and intelligent agents in KM.
CO 5	Learn how to develop KM strategies, perform knowledge audits, and use KM tools for knowledge capture, sharing, and application.

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Course: Embedded Computing Systems

Course Outcomes	Statement
CO 1	Understand the core concepts and architecture of embedded computing systems.
CO 2	Develop programming skills in C, C++, and assembly language for embedded systems.
CO 3	Learn how to interface embedded systems with external hardware like sensors, motors, and displays.
CO 4	Apply real-time operating systems (RTOS) principles to manage system tasks efficiently.
CO 5	Analyze the constraints of embedded systems, such as memory limitations, power consumption, and processing speed.

Course: Simulation And Modeling

Course Outcomes	Statement
CO 1	Understand the principles and techniques used in simulation and modeling of real-world systems.
CO 2	Develop mathematical models to represent dynamic systems in various domains like engineering, biology, and economics.
CO 3	Apply simulation tools and software to analyze and predict system behavior under different conditions.
CO 4	Use statistical methods to validate and verify simulation results for accuracy and reliability.
CO 5	Analyze and interpret simulation data to optimize system performance and make informed decisions.

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Course: Approximation Of Algorithms

Course Outcomes	Statement
CO 1	Understand the concept of approximation algorithms for solving complex optimization problems.
CO 2	Analyze the trade-offs between computational efficiency and solution accuracy in approximation algorithms.
CO 3	Implement greedy, local search, and dynamic programming approaches to approximate solutions for NP-hard problems.
CO 4	Evaluate the performance of approximation algorithms using approximation ratios and error bounds.
CO 5	Apply approximation techniques to solve real-world problems, such as the traveling salesman and knapsack problems.

Course: Software Project Management

Course Outcomes	Statement
CO 1	Identify the different project contexts and suggest an appropriate management strategy.
CO 2	Practice the role of professional ethics in successful software development.
CO 3	Identify and describe the key phases of project management.
CO 4	Determine an appropriate project management approach through an evaluation of the business context and scope of the project
CO 5	Manage the people and control the defects.

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Course: Microwave Engineering

Course Outcomes	Statement
CO 1	Understand the fundamentals of microwave engineering and its applications in telecommunications, radar, and medical devices.
CO 2	Learn about microwave transmission lines, impedance, SWR, and microstrip/stripline technology.
CO 3	Explore microwave components like waveguides, couplers, filters, and active devices such as amplifiers and oscillators.
CO 4	Gain knowledge of microwave measurement techniques and tools such as vector network analyzers and spectrum analyzers.
CO 5	Learn microwave circuit design principles, focusing on amplifiers, oscillators, filters, and simulation software tools.

Course: Software Testing

Course Outcomes	Statement
CO 1	Understand the principles and importance of software testing in ensuring product quality.
CO 2	Develop skills in designing test cases and executing them to identify software defects.
CO 3	Apply different types of testing such as unit, integration, system, and acceptance testing.
CO 4	Use automated testing tools and frameworks to improve testing efficiency and coverage.
CO 5	Analyze and document test results, and troubleshoot issues to ensure software reliability and performance.

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Course: Supply Chain Management-Planning

Course Outcomes	Statement
CO 1	Understand the fundamental concepts and components of supply chain management.
CO 2	Learn techniques for demand forecasting, including time series analysis and causal models.
CO 3	Gain knowledge of inventory management strategies and the Economic Order Quantity (EOQ) model.
CO 4	Study production planning and scheduling methods to optimize resource utilization.
CO 5	Understand supply chain network design principles and tools for optimization and decision-making.

Course: Software Testing

Course Outcomes	Statement
CO 1	Understand the purpose and importance of software testing in the development lifecycle.
CO 2	Learn core testing strategies such as black-box, white-box, and grey-box testing.
CO 3	Gain skills in test planning, defining objectives, and designing test cases.
CO 4	Learn test execution techniques, defect reporting, and communication with development teams.
CO 5	Explore automated testing tools and frameworks like Selenium and JUnit for continuous integration.

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Course: Environmental Studies

Course Outcomes	Statement
CO 1	Understand the multidisciplinary nature and importance of environmental studies and sustainability.
CO 2	Learn about ecosystem structure, function, and energy flow in different ecosystems.
CO 3	Gain knowledge on natural resources, their exploitation, and the environmental impacts.
CO 4	Explore biodiversity, its conservation, and the threats to biodiversity in India.
CO 5	Understand environmental pollution, its types, control measures, and environmental laws.

Course: Environmental Science

Course Outcomes	Statement
CO 1	Understand the fundamentals of environmental systems and natural resources.
CO 2	Analyze the impact of human activities on ecosystems and biodiversity.
CO 3	Evaluate environmental pollution and its control measures.
CO 4	Apply principles of sustainable development and environmental management.
CO 5	Understand environmental laws and policies for conservation.

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Course: Natural Resource Management

Course Outcomes	Statement
CO 1	Understand types and importance of natural resources.
CO 2	Analyze resource utilization and its environmental impact.
CO 3	Study methods for sustainable resource management.
CO 4	Evaluate conservation practices and policies.
CO 5	Apply management strategies for land, water, and biodiversity.

Course: Pollution Control

Course Outcomes	Statement
CO 1	Understand types and sources of pollution.
CO 2	Analyze effects of pollution on environment and health.
CO 3	Study pollution measurement and monitoring techniques.
CO 4	Learn control methods for air, water, and soil pollution.
CO 5	Understand laws and policies related to pollution control.

Course: Computer Graphics Lab

Course Outcomes	Statement
CO 1	Understand basic concepts of computer graphics and its applications.
CO 2	Implement algorithms for drawing shapes and curves.
CO 3	Apply 2D and 3D transformations in graphics programming.
CO 4	Develop simple graphical applications using graphics libraries.
CO 5	Explore concepts of clipping, shading, and animation.

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Course: Data Warehousing & Data Mining Lab

Course Outcomes	Statement
CO 1	Understand the concepts of data warehousing and data mining.
CO 2	Implement data preprocessing and transformation techniques.
CO 3	Apply association, classification, and clustering algorithms.
CO 4	Use data mining tools for pattern discovery and analysis.
CO 5	Analyze and interpret data mining results for decision-making.

Course: Mini Project

Course Outcomes	Statement
CO 1	Identify and define real-world problems for project development.
CO 2	Apply programming and engineering concepts to build solutions.
CO 3	Develop project planning and time management skills.
CO 4	Enhance teamwork and communication through collaborative work.
CO 5	Demonstrate the ability to document and present project outcomes.

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Course Outcomes (COs)
7th Semester

Course: Artificial Intelligence

Course Outcomes	Statement
CO 1	Understand the fundamentals of Artificial Intelligence, intelligent agents, and search algorithms.
CO 2	Explore natural language processing, machine translation, and speech recognition techniques.
CO 3	Learn knowledge representation methods, including graphs, frames, and predicate logic.
CO 4	Understand the architecture and working of expert systems and techniques like genetic algorithms and fuzzy logic.
CO 5	Study pattern recognition concepts, including machine perception, object identification, and visual perception.

Course: Distributed Computing Systems

Course Outcomes	Statement
CO 1	Understand the key concepts and challenges in distributed systems, including message passing and logical clocks.
CO 2	Learn about synchronization, global states, and distributed debugging techniques.
CO 3	Explore agreement protocols and their applications, such as Byzantine agreement and consensus.
CO 4	Study inter-process communication methods, including RPC and case studies in UNIX and JAVA RMI.
CO 5	Gain knowledge in transactions, concurrency control, distributed deadlocks, and replication in distributed systems.

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Course: Advanced Computer System Architecture

Course Outcomes	Statement
CO 1	Understand the evolution of computer architecture and key parallel computing concepts, including multiprocessors and multicomputers.
CO 2	Learn performance metrics for parallel systems and the scalability of parallel algorithms, including Amdahl's and Gustafson's laws.
CO 3	Gain knowledge of processor and memory hierarchy, including advanced processor technologies and memory management techniques.
CO 4	Study bus systems, cache memory organization, and shared memory architectures in parallel systems.
CO 5	Explore pipelining concepts, including linear and nonlinear processors, efficiency, throughput, and instruction pipeline design.

Course: Digital Image Processing

Course Outcomes	Statement
CO 1	Understand digital image representation, image processing steps, and pixel relationships in various color models.
CO 2	Learn spatial and frequency domain techniques for image enhancement, including gray level transformations and Fourier Transform filtering.
CO 3	Explore noise models, filters, and methods for image restoration, along with segmentation techniques like edge detection and morphological processing.
CO 4	Gain knowledge in image compression methods, including error-free and lossy compression, and common image compression standards.
CO 5	Study image representation and recognition techniques, including boundary representation, shape analysis, and pattern recognition using descriptors.

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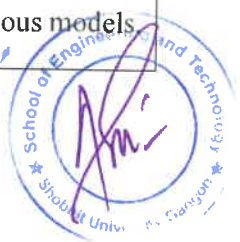
Course: Multimedia Computing

Course Outcomes	Statement
CO 1	Understand the global structure, properties, and challenges of multimedia systems and their components.
CO 2	Learn about sound systems, including speech generation, analysis, and transmission.
CO 3	Explore digital image representation, graphics formats, and the processes of image synthesis, analysis, and transmission.
CO 4	Gain knowledge of video signal representation, animation techniques, and methods for controlling and displaying animation.
CO 5	Study data compression techniques, including coding requirements, entropy coding, and standards like JPEG and MPEG.

Course: Pattern Recognition

Course Outcomes	Statement
CO 1	Understand the fundamental concepts of probability, random processes, and linear algebra, including Bayes' theorem and decision theory.
CO 2	Learn about Bayes' Decision Theory, classifiers, discriminant functions, and decision surfaces for classification.
CO 3	Study parameter estimation methods such as Maximum-Likelihood, Maximum a Posteriori, and Bayesian estimation.
CO 4	Explore unsupervised learning, clustering algorithms, and Gaussian mixture models for parameter estimation.
CO 5	Gain knowledge of sequential pattern recognition using Hidden Markov Models (HMMs), including discrete and continuous models.



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Course: C# Programming

Course Outcomes	Statement
CO 1	Understand the fundamentals of C# and its role in the .NET framework.
CO 2	Gain knowledge of C# syntax, data types, and type safety.
CO 3	Master control structures like if, else, switch, for, while, and do-while in C#.
CO 4	Learn how to define and invoke methods, including overloading and optional parameters.
CO 5	Understand object-oriented programming concepts such as classes, inheritance, and polymorphism in C#.

Course: Python Programming

Course Outcomes	Statement
CO 1	Understand Python basics, including data types, operators, and control flow.
CO 2	Learn to work with lists, strings, and comprehensions for data manipulation.
CO 3	Master dictionaries, tuples, sets, and their related methods and functions.
CO 4	Gain proficiency in file handling, exception management, and regular expressions in Python.
CO 5	Apply object-oriented programming principles such as classes, inheritance, and polymorphism.

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Course: Client Server Computing

Course Outcomes	Statement
CO 1	Understand the various client-server architectures, including Two-Tier, Three-Tier, and N-Tier models, and their differences.
CO 2	Comprehend the roles and functionalities of clients and servers in client-server computing.
CO 3	Identify the key building blocks of client-server systems, including hardware, software, and middleware components.
CO 4	Learn about SQL database servers, transaction processing models, and the concepts of stored procedures and triggers.
CO 5	Familiarize with client-server communication protocols and explore recent trends like Intranet, Extranet, and CORBA.

Course: Neural Network

Course Outcomes	Statement
CO 1	Understand the basics of Artificial Neural Networks (ANN) and the comparison between artificial and biological neural networks.
CO 2	Learn the fundamental models of neural networks, including McCulloch-Pitts, Perceptron, and various learning rules such as Hebbian and Delta learning.
CO 3	Explore Adaline and Madaline networks, along with associative memory models like Hetero and Auto Associative Memory Networks.
CO 4	Study feedback networks, including Hopfield networks and their relationship to BAM, as well as feed-forward networks like Back Propagation and Radial Basis Function networks.
CO 5	Gain knowledge on Self-Organizing Feature Maps, including Kohonen maps and methods for determining winners in networks like LVQ, Max Net, and Mexican Hat.

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Course: Engineering System Modelling and Simulation

Course Outcomes	Statement
CO 1	Understand the basics of system modeling and its importance in representing real-world systems.
CO 2	Apply mathematical tools like linear algebra, calculus, and differential equations in system modeling.
CO 3	Learn system dynamics concepts, including feedback loops, time delays, and stability analysis.
CO 4	Explore control systems, focusing on open-loop and closed-loop systems, and control strategy design.
CO 5	Gain knowledge of discrete event simulation, including event handling, state variables, and simulation tools.

Course: Computer Based Numerical & Statistical Techniques

Course Outcomes	Statement
CO 1	Understand types of errors and floating-point representation, including error propagation and numerical instability.
CO 2	Solve nonlinear equations and linear systems using various methods like Newton-Raphson, Gauss-elimination, and iterative techniques.
CO 3	Apply interpolation and approximation techniques, including Lagrange's and Newton's formulas, cubic splines, and least squares approximation.
CO 4	Perform numerical differentiation and integration using methods like the Trapezoidal rule, Simpson's rule, and Monte Carlo methods.
CO 5	Solve ordinary differential equations using Euler's method, Runge-Kutta methods, and finite difference schemes.

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Course: Law for Engineers

Course Outcomes	Statement
CO 1	Understand constitutional law concepts, including fundamental rights, duties, and emergency provisions.
CO 2	Gain knowledge of human rights in international law and enforcement mechanisms in India.
CO 3	Explore the general principles of contract under the Indian Contract Act and the arbitration and ADR system.
CO 4	Study intellectual property laws in India, including copyrights, trademarks, patents, and related international conventions.
CO 5	Learn about labor laws, corporate law, election provisions under the Indian Constitution, and gender studies.

Course: Intellectual Property Rights

Course Outcomes	Statement
CO 1	Understand the concept of intellectual property (IP) and its types, including patents, copyrights, trademarks, and trade secrets.
CO 2	Learn the legal framework and international treaties that govern the protection of intellectual property.
CO 3	Develop skills to identify and protect intellectual property assets in business and innovation.
CO 4	Understand the process of registering and enforcing intellectual property rights globally.
CO 5	Analyze the ethical and economic implications of intellectual property protection in various industries.

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Course: Employment Law

Course Outcomes	Statement
CO 1	Understand the fundamental principles of employment law and workers' rights.
CO 2	Learn about employment contracts, employee benefits, and workplace policies.
CO 3	Analyze the legal framework surrounding discrimination, harassment, and wrongful termination.
CO 4	Develop skills in handling labor disputes, negotiations, and conflict resolution in the workplace.
CO 5	Understand the role of government regulations and labor unions in shaping employment practices.

Course: Dispute Resolution and Litigation

Course Outcomes	Statement
CO 1	Understand the various methods of dispute resolution, including negotiation, mediation, and arbitration.
CO 2	Learn the legal framework and procedures involved in litigation and court processes.
CO 3	Develop skills in drafting legal documents, including complaints, motions, and settlements.
CO 4	Analyze the advantages and disadvantages of alternative dispute resolution (ADR) vs. litigation.
CO 5	Understand the ethical considerations and strategies for effectively managing disputes in legal contexts.

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Course: Environmental Law

Course Outcomes	Statement
CO 1	Understand the legal principles governing environmental protection and sustainability.
CO 2	Learn about key environmental laws, regulations, and international treaties focused on conservation and pollution control.
CO 3	Develop skills to assess the impact of industrial activities on the environment and navigate legal frameworks.
CO 4	Analyze the role of government agencies, non-governmental organizations, and the public in environmental governance.
CO 5	Understand legal approaches to addressing climate change, natural resource management, and environmental justice.

Course: Artificial Intelligence Lab

Course Outcomes	Statement
CO 1	Develop practical skills in implementing AI algorithms and techniques using programming languages like Python.
CO 2	Apply machine learning methods to solve real-world problems and analyze data patterns.
CO 3	Experiment with neural networks, deep learning, and natural language processing for AI applications.
CO 4	Use AI tools and frameworks, such as TensorFlow and scikit-learn, for model training and testing.
CO 5	Understand the ethical considerations and limitations of artificial intelligence in practical settings.

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Course: Distributed Computing Systems Lab

Course Outcomes	Statement
CO 1	Understand the principles of distributed computing and the challenges in coordinating multiple systems.
CO 2	Develop skills in designing and implementing distributed algorithms for resource management and synchronization.
CO 3	Use tools and frameworks to build and test distributed systems, focusing on fault tolerance and scalability.
CO 4	Implement communication protocols like RPC (Remote Procedure Call) and message-passing for distributed networks.
CO 5	Analyze the performance of distributed systems in terms of latency, throughput, and reliability.

Course: Seminar & Group Discussion

Course Outcomes	Statement
CO 1	Develop skills in presenting ideas clearly and confidently during seminars and discussions.
CO 2	Enhance critical thinking and analytical abilities through active participation in group discussions.
CO 3	Learn how to research, organize, and present information effectively to an audience.
CO 4	Foster teamwork and collaboration skills by engaging in structured group discussions on various topics.
CO 5	Improve communication strategies, including listening, questioning, and providing constructive feedback.

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