Department of Computer Science & Engineering

Course Outcomes

B.Tech-Computer Science and Engineering

FIRST YEAR

Course Name: Physics   **Course Code:** PY101

Course outcomes	
CO1	Understand the interconnections between key concepts in Optics, such as Interference and Diffraction.
CO2	Demonstrate various aspects of light and establish connections between scientific principles and their applications in daily life.
CO3	Analyze the relationship between philosophy and science to identify interconnections between Relativity and Mechanics
CO4	Analyze the connections between the Compton Effect and Quantum Theory to understand their interrelationship.
CO5	Evaluate the impact of advancements in Material Science and Modern Science on the development of new technologies.

Course Name: Basic Electronics   **Course Code:** EC101

Course outcomes	
CO1	Understand and analyze the behavior of semiconductor materials and basic electronic devices like diodes and transistors.
CO2	Design and build circuits using operational amplifiers for various applications.
CO3	Apply Boolean algebra and logic gates to simplify digital circuits.
CO4	Comprehend the working principles of various sensors, transducers, and basic motors for robotics.
CO5	Demonstrate a basic understanding of common consumer electronics and their functionalities.

Department of Computer Science & Engineering

Course Name: Computer Programming   **Course Code:** CS101

	Course outcomes
CO1	Understand basic concepts of computer, networks and formulation of algorithmic solutions to problems.
CO2	Understanding of programming concepts of C language and their implementation.
CO3	Analyze and develop programs on pointers and functions.
CO4	Develop programs on different operations on arrays, matrices & strings.
CO5	Implement programs on structure, union & Dynamic memory allocation.

Course Name: Computer Programming Lab   **Course Code:** CS102

	Course outcomes
CO1	Able to understand the basic concepts of C programming language and their implementation.
CO2	Able to design and develop various programming problems using C programming concepts.
CO3	Able to analyze and develop programs on pointers and functions.
CO4	Able to develop programs on different operations on arrays, matrices & strings.
CO5	Able to implement programs on structure, union & Dynamic memory allocation.

Course Name: Engineering Mathematics   **Course Code:** MT101

	Course outcomes
CO1	Able to calculate rank of matrix, characteristic equation & characteristic roots & use the applicability of Caylay Hamilton Theorem to find inverse of matrix which is very important in many engineering application.
CO2	To develop ability to solve higher derivative, expansion of functions in ascending power of variable & partial derivatives.
CO3	Develops ability to solve Jacobian, error and approximation and Extrema of the function.
CO4	Learn the evaluation policy of some special function like gamma & Beta function. & their relation which is helpful to evaluate some definite integral arising in various branch of Engineering.
CO5	Able to determine vector differentiation and integration.

Course Name: Basic Professional Communication   **Course Code:** LN101

Course outcomes	
CO1	Students will be introduced to the basic understanding of communication and Professional Communication. Knowledge of Professional, cultural and cross-cultural communication will be imparted. Meaning and process of communication, verbal and nonverbal communication will be focused.
CO2	Learning Language through literature aims to develop the students' ability to read the prescribed essays and stories critically and to understand the historical-political and cultural dynamics underlying them.
CO3	Basic tools of communication and improvement in communicative competence.
CO4	Understanding the structural and functional grammar and basic structure of language.
CO5	Enhancement of writing skills in English i.e., writing application, report and various types of letters.

Course Name: Chemistry   **Course Code:** CH101

Course outcomes	
CO1	Understand and compare magnetic behavior and stability of hetero-nuclear diatomic molecules, Significance of hydrogen bonding ,band theory, radius ratio, density of unit cell, fullerenes and graphite
CO2	Comprehension of types of polymers to make an appropriate choice of use of polymers (Natural, synthetic and biodegradable).
CO3	Understanding of reaction intermediates and their applications in different reaction mechanisms and isomerism.
CO4	Application of phase rule, phase diagram, corrosion and its prevention, calculation of activation energy, rate constant, half-life period, emf of electrochemical cells, construction and operation of galvanic cell and concentration cells,
CO5	Analyse calorific value of different fuels and understand water softening methods, principles, instrumentations of UV, IR and NMR spectroscopy and their applications.

Course Name: Chemistry Lab   **Course Code:** CH102

Course outcomes	
CO1	Understand and compare magnetic behavior and stability of hetero-nuclear diatomic molecules, Significance of hydrogen bonding ,band theory, radius ratio, density of unit cell, fullerenes and graphite
CO2	Comprehension of types of polymers to make an appropriate choice of use of polymers (Natural, synthetic and biodegradable).
CO3	Understanding of reaction intermediates and their applications in different reaction mechanisms and isomerism.
CO4	Application of phase rule, phase diagram, corrosion and its prevention, calculation of activation energy, rate constant, half-life period, emf of electrochemical cells, construction and operation of galvanic cell and concentration cells,
CO5	Analyse calorific value of different fuels and understand water softening methods, principles, instrumentations of UV, IR and NMR spectroscopy and their applications.

Course Name: Changing Business with Data Insights   **Course Code:** CS126

Course outcomes	
CO1	Student must be able to understand the building blocks of IBM Cognos.
CO2	Student must be able to articulate the advance dashboarding using IBM Cognos for business trends.
CO3	Student must be able to understand the specialized aspects of Watson Analytics with the help of customize reports, chart and focusing on filters and sorting of data.
CO4	Student must be able to represent the analytical aspects of Watson Analytics using IBM Cognos for better business decisions.
CO5	Student must be know the recent research trends related to building queries, data aggregation and data preparation for decision making.

Department of Computer Science & Engineering

Course Name: Digital Workforce Skills   **Course Code:** CS125

Course outcomes	
CO1	Students must be able to understand the building blocks of Software Digital Workforce Skills.
CO2	Students must be able to articulate the emerging technologies that should embrace a mindset.
CO3	Students must be able to understand the specialized aspects of Ad Hoc analysis and Advance analysis with the help of different real-time case studies.
CO4	Students must be able to represent the analytical aspects of cloud, analytics, artificial intelligence.
CO5	Students must be know the recent research trends related to unlocking hidden values in unstructured data and content inside an image.

Course Name: Physics Lab   **Course Code:** PY104

Course outcomes	
CO1	Demonstrate the occurrence of interference through division of amplitude and division of wavefront.
CO2	Demonstrate the practical applications of polarization, including determining specific rotation and using total internal reflection (TIR) for refractive index calculation
CO3	Apply the concepts of Fraunhofer diffraction for wavelength determination and use Carey Foster's bridge for resistivity measurement.
CO4	Apply the concepts of Fraunhofer diffraction for wavelength determination and use Carey Foster's bridge for resistivity measurement.
CO5	Calculate the energy band gap of semiconductor materials and the viscosity of a liquid.

Department of Computer Science & Engineering

Course Name: Basic Electronics   **Course Code:** EC101

Course outcomes	
CO1	Understand and analyze the behavior of semiconductor materials and basic electronic devices like diodes and transistors.
CO2	Design and build circuits using operational amplifiers for various applications.
CO3	Apply Boolean algebra and logic gates to simplify digital circuits.
CO4	Comprehend the working principles of various sensors, transducers, and basic motors for robotics.
CO5	Demonstrate a basic understanding of common consumer electronics and their functionalities.

Course Name: Engineering Mathematics - II   **Course Code:** MT112

Course outcomes	
CO1	Solve first order linear equations and higher order differential equation of certain types and interpret the solutions.
CO2	To use shift theorems to compute the Laplace transform, inverse Laplace transform and the solutions of second order, linear equations with constant coefficients.
CO3	Able to determine given function in terms of sine and cosine terms in Fourier series.
CO4	Apply problem-solving using concepts and techniques from PDE's and Fourier analysis applied to diverse situations in physics, engineering, financial mathematics and in other mathematical contexts.
CO5	Apply method of least squares to find the curve of best fit for the given data

Department of Computer Science & Engineering

Course Name: Mechanical Engineering Lab   **Course Code:** ME102

Course outcomes	
CO1	To understand the working and basic components of 4 stroke petrol engine and 4 stroke Diesel engine through study their models.
CO2	To understand the working and basic components of 2 stroke petrol and vapor compression refrigeration system through model study
CO3	To understand basic components and working of water tube boiler through model study.
CO4	To learn the technique for determine of hardness and impact strength of a material.
CO5	To learn the technique for determine of compressive strength of a brick through UTM.

Course Name: Basic Electrical Engineering   **Course Code:** EE103

Course outcomes	
CO1	Knowledge about the concept of D.C Circuit Analysis and Network Theorems Circuit.
CO2	Knowledge about Steady State Analysis of Single Phase AC Circuits AC fundamentals.
CO3	Knowledge about concept of Three Phase AC Circuits Three phase system and measuring devices
CO4	Knowledge about Magnetic Circuit and transformer
CO5	Knowledge about Electromechanical energy conversion devices: AC/ DC Machines

Course Name: Basic Mechanical Engineering Lab   **Course Code:** ME101

Course outcomes	
CO1	Explain basic concepts of thermal sciences and temperature measurement on the basis of zeroth law of thermodynamics.
CO2	Understand and apply first and second law of thermodynamics to various processes and real systems.
CO3	Model the problem using free-body diagrams and reach to solution by using equilibrium equations.
CO4	To perform structural analysis for safe design.
CO5	Knowledge of different mechanical properties of engineering materials and its testing.

Department of Computer Science & Engineering

Course Name: Environmental Studies   **Course Code:** ES101

Course outcomes	
CO1	Gain knowledge about environment and ecosystem
CO2	Students will learn about natural resource, its importance and environmental impacts of human activities on natural resource.
CO3	Gain knowledge about the conservation of biodiversity and its importance.
CO4	Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures.
CO5	Students will learn about increase in population growth and its impact on environment.

Course Name: Workshop Technology   **Course Code:** ME104

Course outcomes	
CO1	Perform various operations on the lathe machine to manufacture components.
CO2	Manufacture components using tools and equipment from the fitting shop and carpentry shop.
CO3	Create components in the smithy shop using various smithy tools and equipment.
CO4	Execute different joining operations using welding tools and equipment..
CO5	Fabricate sheet metal components using a variety of sheet metal tools and equipment.

Department of Computer Science & Engineering

SECOND YEAR

Course Name: Cyber Law and Information Security   **Course Code**: CS203

Course Outcomes	
CO1	Understand key terms and concepts in cyber law, intellectual property and cybercrimes(internet security threats), trademarks and domain theft.
CO2	Apply and analyze knowledge of technology, E-business, and law to minimize the occurrence and impact of information security incidents.
CO3	Understand and evaluate the principles of Information Security, including confidentiality, integrity, and availability, in relation to information systems.
CO4	Understand and apply cryptographic techniques and methods to detect and prevent network intrusions, ensuring secure data transmission.
CO5	Understand key terms and concepts in cyber law, intellectual property and cybercrimes(internet security threats), trademarks and domain theft.

Course Name: Data Science Fundamentals   **Course Code:** CS260

Course Outcomes	
CO1	Recall and understand the Data Science Life Cycle, including steps such as data wrangling, data exploration, and model selection.
CO2	Apply and analyze data preprocessing techniques, including data cleaning, integration, and transformation, to uncover correlations within datasets.
CO3	Conduct and evaluate Exploratory Data Analysis (EDA) to extract meaningful insights from data.
CO4	Classify and distinguish Machine Learning algorithms as Supervised or Unsupervised, assessing their applications and suitability.
CO5	Implement and analyze Machine Learning algorithms to address real-world data science problems.

Department of Computer Science & Engineering

Course Name: Cloud Application Development Lab **Course Code:** CS266

Course Outcomes	
CO1	Recall and understand the global vision and foundational concepts of Cloud Computing, recognizing its impact from an international perspective.
CO2	Apply and analyze various computing solutions available on IBM Cloud, considering market perspectives and emerging trends in Cloud Computing.
CO3	Evaluate and implement the architecture of APIs and services on IBM Cloud, analyzing their role in efficient Cloud Computing solutions.
CO4	Apply, integrate, and analyze Node.js applications with Watson services on IBM Cloud for enhanced application functionality.
CO5	Design, build, and assess advanced architectures within Kubernetes clusters to achieve scalable and efficient cloud-native applications.

Course Name: Cloud Application Development **Course Code:** CS261

Course Outcomes	
CO1	Recall and understand the global vision and foundational concepts of Cloud Computing, recognizing its impact from an international perspective.
CO2	Apply and analyze various computing solutions available on IBM Cloud, considering market perspectives and emerging trends in Cloud Computing.
CO3	Evaluate and implement the architecture of APIs and services on IBM Cloud, analyzing their role in efficient Cloud Computing solutions.
CO4	Apply, integrate, and analyze Node.js applications with Watson services on IBM Cloud for enhanced application functionality.
CO5	Design, build, and assess advanced architectures within Kubernetes clusters to achieve scalable and efficient cloud-native applications.

Course Name: Graph Theory and Applications   **Course Code:** CS281

Course Outcomes	
CO1	Demonstrate knowledge of fundamental concepts in graph theory, including the properties, characterization, and applications of graphs and trees.
CO2	Understand and Apply models of Graph theory, Probability theory respectively to effectively solve problems of connectivity and uncertainty.
CO3	Analyze, evaluate, and create representations of graphs, trees, and random phenomena to model and interpret real-life situations using graph theory principles.
CO4	Interpret, apply, and assess models from graph theory and probability theory to address complex challenges in engineering and real-world scenarios.
CO5	Develop, apply, and evaluate efficient algorithms for solving graph-related problems across various engineering and scientific domains.

Course Name: Computer Graphics   **Course Code:** CS207

Course Outcomes	
CO1	Understand the concept of Computer Graphics components and their relevance to classical and modern problems.
CO2	Illustrate, construct, and implement the algorithms for Line generation, Curve generation, Display File, Segments and Polygon filling.
CO3	Interpret, examine, and apply the process of mapping from world coordinates to device coordinates, including techniques for clipping and projections.
CO4	Explore, demonstrate, and manipulate two-dimensional and three-dimensional graphics operations such as translation, scaling, rotation, reflection, and shearing, along with problem-solving applications of these transformations.
CO5	Recognize, analyze, and implement curve generation methods, hidden surface and line removal techniques, and foundational concepts in animation..

Department of Computer Science & Engineering

Course Name: Data Structure Using C   **Course Code:** CS204

Course Outcomes	
CO1	Recall and understand the basics of data structures, their programming implementations, and foundational concepts for developing efficient solutions.
CO2	Apply, analyze, and evaluate stack and queue data structures, understand the phenomenon of recursion, and implement various applications based on these principles.
CO3	Develop and assess solutions using tree data structures, applying recursive approaches to enhance solution efficiency and implementation.
CO4	Apply, analyze, and evaluate different searching and sorting algorithms, assessing their performance to ensure optimized data handling.
CO5	Understand and implement graph data structures, explore file organization, and develop optimized solutions through graph-based approaches

Course Name: Object Oriented Concepts Using Java   **Course Code:** CS270

Course Outcomes	
CO1	Demonstrate foundational Java programming skills, including installation, development setup, source file structuring, compilation, and execution.
CO2	Apply, analyze, and demonstrate proficiency in Java fundamentals, covering object manipulation, memory management, constructors, methods, static members, and cloning for efficient program development.
CO3	Analyze and implement core Java concepts such as class fundamentals, inheritance, and interfaces, employing packages for effective access control and code organization.
CO4	Learn ,apply and evaluate exception handling in Java, mastering exception control flow, array operations, and string manipulation for robust program execution
CO5	Develop, apply, and assess multi-threaded programming concepts in Java, including thread synchronization, and manage input/output operations like file handling and serialization.

Department of Computer Science & Engineering

Course Name: Principles of Management and Engineering Economics   **Course Code:** BM225

Course Outcomes	
CO1	Understand the fundamental concepts and applications of engineering economics.
CO2	Understand the basic principles and functions of economics
CO3	Analyze the role of the banking sector and the functions of money in economic systems.
CO4	Understand the concepts of management and its various functions.
CO5	Apply principles of personality development, learning theories, and group behavior in practical contexts.

Course Name: Digital Electronics   **Course Code:** EC209

Course Outcomes	
CO1	Understand and apply mathematical representations for various number system conversions, identify complement types, and solve problems involving 1's, 2's, 9's, and 10's complements.
CO2	Analyze Boolean expressions, evaluate axioms and theorems, and simplify using K-Map methods. Understand and evaluate combinational circuits like gates, adders, subtractors, multiplexers, and encoders.
CO3	Select and design sequential logic components, including flip-flops, shift registers, and counters, for specific applications.
CO4	Understand and analyze asynchronous sequential logic concepts, including transition tables, flow tables, state reduction, and circuit design using latches.
CO5	Define logic devices using AND and OR arrays, and design, solve, and modify PLD-based systems for efficient implementation.

Department of Computer Science & Engineering

Course Name: Discrete Structure   **Course Code:** CS206

Course Outcomes	
CO1	Recall and understand set operations (union, intersection, complement, difference) using proper notation; interpret Venn diagrams and determine mappings as functions or relations.
CO2	Apply and analyze ordered sets, Hasse diagrams, and Boolean algebra properties, including logic gates and Karnaugh maps for effective simplification
CO3	Understand and evaluate logical propositions, first-order logic, truth tables, and logical equivalencies to develop valid logical arguments.
CO4	Apply and analyze recurrence relations, generating functions, and properties of graphs like bipartite and Euler graphs, determining chromatic numbers.
CO5	Identify and solve Recurrence Relations, Generating Functions, Bipartite, Regular, Connected Components in a Graph, Euler Graphs, Hamiltonian Path and Circuits, Chromatic Number

Course Name: Human Values & Professional Ethics   **Course Code:** BM226

Course Outcomes	
CO1	Development of moral and ethical values, right understanding and relationships
CO2	Knowledge of Moral Rights and Moral rules, Moral character and responsibilities. Privacy, Confidentiality, Intellectual Property rights and its laws.
CO3	Awareness about the Professional Responsibility of engineers, Responsibility of engineers related to risks, hazards and safety.
CO4	Development of Engineers Ethics. Understanding of variety of moral issues, moral judgment concerning the profession.
CO5	Understanding of various global issues; Environmental ethics - computer ethics - weapons development.

Department of Computer Science & Engineering

Course Name: Data Structure using C Lab   **Course Code:** CS208

Course Outcomes	
CO1	Identify and understand operations like insertion, deletion, and traversal mechanisms on various data structures.
CO2	Apply and implement stack and queue data structures, along with their applications in solving real-world problems.
CO3	Implement and analyze different types of trees, including binary tree traversals, to solve problems efficiently.
CO4	Implement and evaluate different sorting and searching algorithms, analyzing their performance and suitability for different use cases.
CO5	Perform basic operations on graphs, including creation and traversal, and determine the minimum spanning tree using appropriate algorithms.

Course Name: Python Programming   **Course Code:** CS272

Course Outcomes	
CO1	Understand the process of installing and configuring Python along with its IDEs.
CO2	Apply and create basic programs using Python's data structures, demonstrating foundational programming skills.
CO3	Develop, apply, and evaluate small modules and components using object-oriented programming principles in Python
CO4	Implement, analyze, and develop applications utilizing Python libraries, focusing on effective file handling techniques.
CO5	Create, apply, and assess working applications in Python, integrating multiple programming concepts for practical implementation

Department of Computer Science & Engineering

Course Name: Object Oriented concepts using Java Lab   **Course Code:** CS271

Course Outcomes	
CO1	Demonstrate and apply skills in using an integrated development environment to write, compile, run, and test basic object-oriented Java programs.
CO2	Read, analyze, and make elementary modifications to Java programs aimed at solving real-world problems.
CO3	Implement and validate user input within a Java program.
CO4	Identify, analyze, and correct defects and common security vulnerabilities in Java code.
CO5	Document Java programs effectively using Javadoc to enhance code readability and maintainability.

Course Name: Digital electronics Lab   **Course Code:** EC214

Course Outcomes	
CO1	Define various types of logic gates, identify their corresponding ICs, and verify their truth tables through practical experiments.
CO2	Analyze, design, and implement combinational logic circuits for specified applications.
CO3	Analyze, design, and implement sequential logic circuits to meet specific requirements.
CO4	Derive basic gates, adders, and subtractors using universal gates and evaluate their efficiency in circuit design.
CO5	Illustrate and realize Boolean expressions in SOP form and design equivalent circuits using logic gates.

Department of Computer Science & Engineering

Course Name: Full Stack Development-Front End   **Course Code:** CS290

Course Outcomes	
CO1	Comprehensive understanding of the role and importance of frontend development in web applications
CO2	Remembering basics of JavaScript as a programming language and integrating JavaScript with HTML and CSS.
CO3	Analyze and comprehend React routing and state management, covering both fundamental and advanced concepts.
CO4	Apply acquired knowledge and skills to build a web project that consumes APIs and incorporates effective styling.
CO5	Analyze and handle various aspects of full stack development, ensuring they can build robust and scalable web applications.

Course Name: Mathematical Analysis for Computer Science & Engineering   **Course Code:** MT238

Course Outcomes	
CO1	Understand and apply numerical methods such as Bisection, Regula-Falsi, Iteration, Newton-Raphson, and LU Decomposition to solve different types of equations, including their convergence analysis.
CO2	Explore and apply various interpolation methods to approximate data effectively.
CO3	Implement numerical differentiation and integration techniques to solve real-world problems involving complex functions.
CO4	Solve ordinary differential equations using numerical techniques and analyze the results.
CO5	Develop an understanding of complex analysis, including analyticity, mapping, and evaluating definite integrals using simplified techniques.

Department of Computer Science & Engineering

Course Name:Database Management   **Course Code:** CS212

Course Outcomes	
CO1	*Demonstrate* the basic elements of a database management system and *apply* the conceptual models of a database using ER modeling for real life applications.
CO2	*Create* and populate RDBMS for a real-life application, with constraints and keys using SQL. *Retrieve* any type of information from a database by formulating complex queries in SQL & Relational Algebra.
CO3	*Apply* concepts of normalization to *design* an optimal and efficient database.
CO4	*Understand* and *analyze* the concepts of indexing, hashing, database transactions, serializability, recoverability, deadlock, and ways to recover from deadlock.
CO5	*Analyze* the concepts of database locks, timestamps and various concurrency control protocols to manage concurrent database access.

Course Name: Computer Organization & Architecture   **Course Code:** CS284

Course Outcomes	
CO1	Describe the basic organization of computer and data representation techniques used in computer systems.
CO2	Resolve the issues arising in the design of elements of memory hierarchy.
CO3	Explain and design the control unit using both hardwired and microprogrammed approaches.
CO4	Acquire knowledge and evaluate advanced concepts of performance measurement and parallel processing.
CO5	Explain, compare and evaluate high performance processors.

Department of Computer Science & Engineering

Course Name: Theory of Computation   **Course Code:** CS292

Course Outcomes	
CO1	Understand finite automata theory and its practical applications, recognizing its foundational role in computational theory.
CO2	Comprehend and analyze the Chomsky Hierarchy, regular grammars, and regular expressions, applying them to solve problems in language theory and computational complexity.
CO3	Analyze and manipulate context-free grammars and languages, applying grammatical structures to reason about and work with formal languages.
CO4	Understand and evaluate pushdown automata theory, exploring the relationships between different computational models and their application.
CO5	Apply, evaluate, and analyze Turing Machines and computability theory to explore the limits of computation and address complex computational challenges.

Course Name: Computer Organization & Architecture Lab   **Course Code:** CS285

Course Outcomes	
CO1	Demonstrate, design, and implement the output of basic logic gates for different combinations of inputs.
CO2	Design, implement, and evaluate various flip-flops (SR, JK, D, and T) based on their behavior.
CO3	Implement half adder and full adder circuits, and evaluate their functionality.
CO4	Design and implement counters and registers, and analyze their functionality in digital circuits..
CO5	Design and implement multiplexers and demultiplexers, and evaluate their performance in digital systems.

Department of Computer Science & Engineering

Course Name: Full Stack Development- Front End Lab   **Course Code:** CS291

Course Outcomes	
CO1	Design and implement user interfaces that prioritize usability and provide an enhanced user experience.
CO2	Implement dynamic and interactive features on web pages using JavaScript Front-End Frameworks.
CO3	Demonstrate and create well-structured and styled web pages using HTML and CSS, ensuring adherence to best practices.
CO4	Apply fundamental JavaScript concepts to solve programming challenges.
CO5	Analyze and synthesize various aspects of full stack development, ensuring the ability to build robust and scalable web applications.

Course Name: Advance Java Programming Lab   **Course Code:** CS282

Course Outcomes	
CO1	Identify and explain the foundational concepts of Advanced Java programming and its applications.
CO2	Design and develop interactive web pages using applets, applying Java programming principles effectively.
CO3	Analyze and develop server-side applications using Servlets and JSP for dynamic content generation.
CO4	Develop and implement projects utilizing Swing and JavaBeans, enhancing GUI capabilities.
CO5	Apply and implement database connectivity in Java applications using JDBC-ODBC, ensuring robust data integration.

Course Name: DBMS Lab   **Course Code:** CS220

Course Outcomes	
CO1	Illustrate ER model and identify the roles and privileges of various users in a database.
CO2	Apply common SQL statements using DDL, DML & DCL statements to perform various operations.
CO3	Construct SQL queries for various operations in a database.
CO4	Interpret Embedded and Nested queries
CO5	Assess the need of creating views to manage the database.

THIRD YEAR

Course Name: Design and Analysis of Algorithm   **Course Code:** CS301

Course Outcomes	
CO1	Design, analyze and implement efficient algorithms using classical design techniques or create new solution techniques to address given problems.
CO2	Analyze and evaluate an algorithm's utility in a given context, applying divide-and-conquer strategies for solving problems with smaller inputs and extending the solution to larger inputs.
CO3	Evaluate and compare multiple solutions to a problem using standard mathematical techniques, and select the most optimal solution.
CO4	Analyze and compare different data structures, and modify or create new data structures to efficiently solve given design problems.
CO5	Categorize and analyze different types of complexities for various problems, and develop non-deterministic solutions to handle problems with large complexities.

Course Name: Principles of Operating System   **Course Code:** CS303

Course Outcomes	
CO1	Understand the fundamental concepts, functions, and services of an operating system.
CO2	Design and implement effective memory management schemes to minimize wastage and improve response time.
CO3	Apply CPU scheduling algorithms to manage processes and optimize performance.
CO4	Analyze and resolve issues related to process synchronization, deadlocks, and concurrency.
CO5	Explore and evaluate file and disk management techniques, and understand protection and security mechanisms in operating systems.

Course Name: Theory Of Automata and Formal languages   **Course Code:** CS304

Course Outcomes	
CO1	Demonstrate computational mathematical models for problem solving and describe how they relate to formal languages.
CO2	Understand and analyze the relationship among language classes and grammars with the help of Chomsky Hierarchy.
CO3	Identify and apply rigorous formal mathematical model for proving different properties of grammars, languages and automata.
CO4	Recall mathematical foundations and algorithmic principles, understand their role in system design, apply to modeling, analyze effectiveness, and evaluate real-world utility.
CO5	Examine the applicability of theoretical concepts to practical engineering problems, such as compiler design.

Department of Computer Science & Engineering

Course Name: Software Engineering   **Course Code:** CS340

Course Outcomes	
CO1	Identify and understand the most suitable SDLC model based on user requirements.
CO2	Analyze and estimate the total effort required while evaluating and managing potential risks during software development.
CO3	Design a high-quality SRS with cohesive and loosely coupled software using structured techniques.
CO4	Apply standard coding guidelines and create effective test cases to evaluate and uncover errors.
CO5	Identify, understand, apply, and evaluate modern CASE tools and international quality standards to develop high-quality software.

Course Name Hadoop Fundamentals   **Course Code:** CS391

Course Outcomes	
CO1	Understand the core concepts of big data analytics and the Hadoop ecosystem to analyze its significance and future potential.
CO2	Develop expertise in using tools like Hadoop, NoSQL, and MapReduce to manage and process large datasets effectively.
CO3	Apply fundamental techniques and principles of big data analytics to ensure scalability and streaming capabilities.
CO4	Analyze and evaluate big data frameworks and their application in solving complex real-world decision-support problems.
CO5	Design and implement innovative solutions to address challenges in big data management and analytics.

Course Name: Visual Programming Lab   **Course Code:** CS343

Course Outcomes	
CO1	Recall and explore the Visual Basic Integrated Development Environment (IDE).
CO2	Apply and analyze decision structures for determining different operations.
CO3	Design and develop procedures, sub-procedures, and functions for creating manageable code.
CO4	Create, debug, and build Visual Basic applications.
CO5	Design and apply object-oriented programming concepts, including classes, objects, methods, inheritance, and polymorphism in Visual Basic programs.

Course Name: Open Source Lab   **Course Code:** CS310

Course Outcomes	
CO1	Explain open-source licenses, project structure, and setup.
CO2	Demonstrate Linux proficiency by installing packages, scheduling tasks, and executing administrative commands.
CO3	Understand web servers, protocol-based intercommunication, and web page delivery processes.
CO4	Analyze database schema designs, apply normalization, and formulate complex MySQL queries.
CO5	Design and develop client-server applications and GUI-based solutions using open-source scripting languages.

Course Name: Design and Analysis of Algorithm Lab   **Course Code:** CS302

Course Outcomes	
CO1	Understand and apply the basic concepts of Divide and Conquer algorithms and their implementation.
CO2	Understand and develop solutions for optimization problems using Greedy algorithms.
CO3	Analyze and develop dynamic programming solutions, including their implementation for complex problems.
CO4	Understand and implement Backtracking techniques for solving problems through efficient recursive strategies.
CO5	Understand and develop logic for implementing different augmenting data structures, such as Red-Black Trees.

Course Name: Cloud Computing   **Course Code:** CS334

Course Outcomes	
CO1	Understand and explain the paradigms of cloud computing and different computing techniques.
CO2	Analyze and articulate the concepts, key technologies, strengths, limitations, and potential applications of cloud computing.
CO3	Identify and evaluate the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, and deployment models such as public, private, and hybrid clouds.
CO4	Interpret data, scalability, and various cloud services to optimize database efficiency for cloud storage.
CO5	Recommend and justify suitable cloud computing solutions for specific applications, considering efficiency and scalability.

Department of Computer Science & Engineering

Course Name Hadoop Lab **Course Code:** CS393

Course Outcomes	
CO1	Understand the core concepts of big data analytics and the Hadoop ecosystem to analyze its significance and future potential.
CO2	Develop expertise in using tools like Hadoop, NoSQL, and MapReduce to manage and process large datasets effectively.
CO3	Apply fundamental techniques and principles of big data analytics to ensure scalability and streaming capabilities.
CO4	Analyze and evaluate big data frameworks and their application in solving complex real-world decision-support problems.
CO5	Design and implement innovative solutions to address challenges in big data management and analytics.

Course Name: Introduction to Internet of Things **Course Code:** CS341

Course Outcomes	
CO1	Recall and understand the concepts of the Internet of Things (IoT) and develop IoT applications.
CO2	Understand and analyze IoT sensors and technological challenges, focusing on wireless communication, energy efficiency, and sensing modules.
CO3	Understand, analyze, and evaluate specialized aspects of IoT devices and their functionalities.
CO4	Explain the importance of data analytics and security in IoT and evaluate their integration into IoT systems.
CO5	Understand, apply, and evaluate IoT concepts through hands-on projects designed for Raspberry Pi.

Department of Computer Science & Engineering

Course Name: Digital Image Processing   **Course Code:** CS312

Course Outcomes	
CO1	Explain basic image processing techniques for solving real problems
CO2	Identify and apply image processing techniques for solving problems in computer science
CO3	Demonstrate and evaluate algorithms for higher level image processing.
CO4	Develop understanding for object registration and recognition
CO5	Develop an application using existing image processing algorithms

Course Name Predictive Analysis   **Course Code:** CS395

Course Outcomes	
CO1	Recall the fundamental concepts of Statistical Modeling and Machine Learning and explain their relationships and differences.
CO2	Analyze real-life examples of Machine Learning to evaluate its societal impacts and implications.
CO3	Apply Python libraries, such as scikit-learn, to implement and experiment with Machine Learning techniques in a lab setting.
CO4	Apply Python libraries like scikit-learn to implement Machine Learning algorithms such as Regression, Classification, and Clustering
CO5	Design and develop real-world solutions using Machine Learning models, including Recommender Systems based on Content-Based and Collaborative Filtering.

Course Name: Data Compression　　　　　　　　　**Course Code:** CS342

Course Outcomes	
CO1	Understand the importance of compressions, and different compression models
CO2	Solve the various problems based on lossless compression approach such as Huffman, adaptive Huffman models
CO3	Solve problems using arithmetic and dictionary based compression techniques.
CO4	Apply partial prediction matching, and learn to transformation of source based on Transform algorithms
CO5	Represent the various dynamic model in the form of structured vector representation

Course Name:Microprocessor and its Application　　　　　**Course Code:** CS313

Course Outcomes	
CO1	Understand the basic architecture and functionality of 8085 and 8086 microprocessors.
CO2	Impart the knowledge about the instruction set of Microprocessor and demonstrate assembly language Programming
CO3	Analyze data transfer schemes and their practical applications, and design solutions using these techniques
CO4	Explain and apply the concepts of microprocessor interfacing for hardware integration.
CO5	Analyze the concept of advance microprocessor, microcontroller and Embedded System.

Course Name: Compiler Design **Course Code:** CS315

Course Outcomes	
CO1	Understand the fundamental concepts of preprocessors, translation rules, cross-compilers, assemblers, loaders, and linkers.
CO2	Apply, analyze, and evaluate the basic principles of compilers, including their core components, algorithms, and necessary data structures.
CO3	Understand, analyze, and assess the functions and complexities involved in modern compilers, exploring advanced compilation techniques.
CO4	Develop, implement, and evaluate code generation algorithms to produce optimized machine code from high-level code.
CO5	Understand and apply the concepts of flow graphs, machine-dependent and machine-independent optimizations, and intermediate code representations to enhance compilation efficiency.

Course Name: Computer Networks **Course Code:** CS305

Course Outcomes	
CO1	Recall and understand communication and networking fundamentals, including transmission media, switching techniques, network components, and OSI and TCP/IP models.
CO2	Demonstrate and apply error handling, flow control, and access control mechanisms for efficient and secure Data Link layer operations.
CO3	Understand and analyze routing mechanisms, design networks using IP addressing, and implement routing algorithms via simulation.
CO4	Evaluate TCP congestion control, differentiate connectionless and connection-oriented services, and apply flow control techniques to assess network performance.
CO5	Recognize and analyze factors influencing network performance, assess Quality of Service, and resolve issues using application layer protocols.

Course Name: Compiler Design Lab **Course Code:** CS316

Course Outcomes	
CO1	Identify and understand the basic concepts of tokens, lexemes, and the flow of control.
CO2	Design and apply various programming concepts, such as case statements and procedure calls.
CO3	Analyze and compute first and follow, and used the concept first and follow, to implement various parsing algorithms.
CO4	Develop programs for implementing different types of parsers.
CO5	Implement programs for various Syntax-Directed Translations (SDTs) and evaluate their performance..

Department of Computer Science & Engineering

Course Name: Microprocessor Lab   **Course Code:** CS314

Course Outcomes	
CO1	Identify relevant information to supplement the Microprocessor and Microcontroller course.
CO2	Develop programming strategies, select appropriate mnemonics, and implement programs on training boards.
CO3	Practice different types of programming keeping in mind technical issues and evaluate possible causes of discrepancy in practical experimental observations in comparison
CO4	Develop testing and experimental procedures on Microprocessor and Microcontroller analyse their operation under different cases.
CO5	Prepare professional quality textual and computational results, incorporating accepted data analysis and synthesis methods, simulation Software and word-processing tools.

Course Name: Computer Network lab   **Course Code:** CS306

Course Outcomes	
CO1	Understand the practical approach to network communication protocols.
CO2	Understand network layers, structure/format and analyze the role of each network layer.
CO3	Design and implement various network application such as data transmission between client and server, file transfer, real-time multimedia transmission.
CO4	Apply and analyze various routing protocols, algorithms, and internetworking techniques
CO5	Understand the structure and organization of computer networks; evaluate the division into network layers, role of each layer, and relationships between the layers.

Course Name: Advance Computer Architecture   **Course Code:** CS345

Course Outcomes	
CO1	Registers, bus as well as memory and its hierarchy and input/output devices.
CO2	Division based algorithms for different representation of data and discuss I/O interfaces, ports and Data Transfer modes
CO3	Register and stack organization and construct different control units.
CO4	Types of memory and memory mapping of one type with other
CO5	Knowledge about Interconnection Network, non-blocking network, crossbar network, and shuffle exchange network.

Course Name: Real Time System   **Course Code:** CS320

Course Outcomes	
CO1	Identify and understand the concepts of operating systems and their application in real-time systems, including tasks and scheduling.
CO2	Compare and analyze the various parameters related to the different types of scheduling in single processor and multiprocessor environments.
CO3	Understand, apply, and analyze the concepts of real-time databases and their practical applications.
CO4	Apply the basic concepts of fault tolerance and clocks to design an effective real time system.
CO5	Identify, understand, apply, analyze, and evaluate protocols for effective resource sharing in real-time environments.

Course Name: Concepts in Advance Database System   **Course Code:** CS346

Course Outcomes	
CO1	Understand and apply principles of database management systems for query processing and query optimization.
CO2	Explain object-oriented database, model, database tuning, benchmarks, and search key performance.
CO3	Demonstrate knowledge of distributed databases, including structure, query processing, recovery, and protocols.
CO4	Understand and apply the concept of database security techniques.
CO5	Explore emerging databases such as Temporal, Spatial, Multimedia, Data Mining, and Web databases and analyze their applications.

Course Name: Software Project & Quality Management   **Course Code:** CS311

Course Outcomes	
CO1	Analyze the systematically stepwise project planning.
CO2	Have knowledge of strategic program management, analysis of technical assessment of projects and study and analysis of different Cost-Benefit Evaluation Techniques.
CO3	Apply, analyze and compare effort estimation and different network planning models.
CO4	Evaluation and analysis of different resources and Critical Path, monitoring and control, Prioritizing monitoring and change control.
CO5	Compare and analyze modern project management, contract management, ISO Standards, CMM, Six Sigma Approach.

Course Name: Green Computing   **Course Code:** CS347

Course Outcomes	
CO1	Understand Green IT fundamentals, enabling them to develop and implement strategies for reducing environmental impact in IT operations.
CO2	Learn the life cycle of green devices and evaluate software impact on platform power.
CO3	Develop expertise in implementing sustainable practices across various assets and apply best practices for green PCs.1
CO4	Acquire the knowledge of Socio-cultural dimensions of Green IT and Understand the concept of Green Compliance.
CO5	Develop the ability to apply green IT strategies and understanding of the regulatory environment impacting IT.

Course Name: Human Computer Interaction   **Course Code:** CS348

Course Outcomes	
CO1	Acquire fundamental concepts of computer components functions regarding interaction with human and vice versa
CO2	Analyze interface problems to recognize what design approach and interaction styles are required in the light of usability standards and guidelines.
CO3	Apply basic concepts to develop user-interaction strategies and evaluate usability while adhering to realistic constraints such as social, political, and ethical norms.
CO4	Ability to design and develop an interface by using appropriate HCI techniques that are preferred by the user.
CO5	Ability to apply different evaluation techniques with case studies.

FOURTH YEAR

Course Name: Artificial Intelligence   **Course Code:** CS422

Course Outcomes	
CO1	Understand and explain the fundamental principles of intelligent agents and their applications in solving real-world problems.
CO2	Analyze and evaluate heuristics to identify optimal solutions for problem-solving under various constraints and conditions.
CO3	Develop and organize knowledge bases using logic programming and apply inference mechanisms to derive meaningful conclusions.
CO4	Apply statistical and probabilistic machine learning techniques to design solutions for complex real-world scenarios.
CO5	Design and implement expert systems and advanced algorithms, utilizing evolutionary programming, swarm intelligence, and PROLOG for innovative problem-solving.

Course Name: Distributed System   **Course Code:** CS410

Course Outcomes	
CO1	Understand the software and hardware concepts of distributed systems
CO2	Evaluate and analyze the issues and implementations of deadlock detection and the agreement problems.
CO3	Analyze the RMI, RPC and security issues, replication and fault tolerance in the distributed systems.
CO4	Compare and analyze the flat and nested transactions, applications and analysis of locks in view of distributed systems, File systems and recent advances.
CO5	Implement and analyze distributed multimedia, CORBA RMI, Java RMI, CORBA services.

Course Name: Cryptography and Network Security   **Course Code:** CS412

Course Outcomes	
CO1	To understand both classical and modern encryption techniques, as well as the ability to analyze cryptographic systems and evaluate their effectiveness in securing data.
CO2	Apply your knowledge of block cipher modes to achieve secure communication and analyze the role of random numbers in cryptographic algorithms.
CO3	Apply, analyze and compare various public key cryptography techniques
CO4	To design, implement, and analyze secure authentication and digital signature systems in real-world scenarios.
CO5	Able to analyze appropriate secure communication protocols based on security requirements and implement basic network security measures using firewalls.

Course Name: SciLab   **Course Code:** CS424

Course Outcomes	
CO1	Explain the main features of the SCILAB program development environment for application in advanced learning
CO2	Perform and demonstrate basic mathematical operations using Scilab software.
CO3	Implement loops and conditional statements to solve problems using Scilab software.
CO4	Analyze and interpret different data types through plotting functions in Scilab software..
CO5	Design and simulate various system models using the Xcos simulator.

Department of Computer Science & Engineering

Course Name: Artificial Intelligence Lab   **Course Code:** CS423

Course Outcomes	
CO1	Understand the foundational principles of intelligent agents and their application in solving real-world problems..
CO2	Analyze and Identify the best heuristic for problem solving that will lead to finding the optimal solution within constraints and adverse conditions.
CO3	Develop and represent knowledge using Python logic programming of ,create knowledge base and apply inference mechanisms.
CO4	Apply statistical and probabilistic machine learning techniques for a real-world problem in order to solve it.
CO5	Design and develop an expert system, solve problems using evolutionary programming, using swarm intelligence and develop programs using Python

Course Name: Minor Project   **Course Code:** CS421

Course Outcomes	
CO1	Develop proficiency in project planning, technical skills, and team management for successfully executing the year major project in Computer Science and Engineering.
CO2	Apply advanced computer science knowledge to innovate and implement solutions in the final year major proj
CO3	Gain practical experience in the software development life cycle throughout the final year minor project. Demonstrate effecti ve communication and documentation skills through reports and presentations for the final year minor project.

Course Name: Industrial Training   **Course Code:** CS300

Course Outcomes	
CO1	Develop practical skills relevant to the industry through hands-on training and exposure to real-world tasks and challenges.
CO2	Enhance professional competencies such as communication, teamwork, problem-solving, and adaptability within an industrial setting.
CO3	Apply theoretical concepts learned in academic studies to solve practical problems and contribute effectively to projects within the industry, bridging the gap between academic learning and real-world applications.
CO4	Demonstrate Proficient Communication and documentation Skills in Reports and Presentations Throughout and Following Industrial Training / Internship.

Department of Computer Science & Engineering

Course Name: Seminar   **Course Code:** CS451

Course Outcomes	
CO1	Identify recent technical advancements in chosen domains of interest.
CO2	Analyze the relevance and applicability of modern software tools and technologies.
CO3	**Enhance** presentation and communication skills through structured practice.
CO4	Develop proficiency in preparing technical reports effectively.

Course Name: Mobile Computing   **Course Code:** CS417

Course Outcomes	
CO1	Understand and compare the various wireless communication technologies and signal characteristics
CO2	Explore and analyze the fundamentals and applications of Channel Allocation techniques.
CO3	Understand telecommunications systems with a focus on GSM and satellite technology.
CO4	Investigate and apply the key aspects and technologies of Wireless LAN.
CO5	Learn and evaluate Mobile IP protocols and requirements for efficient mobility management.

Course Name: Fuzzy Logic & Neural Network   **Course Code:** CS415

Course Outcomes	
CO1	Understand and analyze the concept of soft computing techniques and their applications
CO2	Analyze and Illustrate various neural network architectures.
CO3	Acquire knowledge about the state-of-the-art of different Unsupervised Learning Algorithms.
CO4	Understand and apply basic concepts of fuzzy systems and their methodologies for solving real-world problems.
CO5	Evaluate and employ optimization methods and evolutionary computation techniques to solve complex, multi-domain problems effectively.

Course Name: Data Warehousing and Data Mining   **Course Code:** CS418

Course Outcomes	
CO1	Understand the fundamental concepts of data warehousing and related techniques to establish a strong knowledge base.
CO2	Design and construct a data warehouse using historical data and perform OLAP operations to extract valuable insights.
CO3	Pre-process the data using cleaning, integration, transformation and reduction and find associations and correlations among that data.
CO4	Classify the given dataset by using statistical and probabilistic models to predict the class labels of new data.
CO5	Perform cluster analysis by using some major clustering methods and work on the recent advancements on text and web mining.

Course Name: Pattern Recognition   **Course Code:** CS419

Course Outcomes	
CO1	Understand basic concepts in pattern recognition along with its mathematical foundation.
CO2	Analyze and explain pattern recognition theories, including Bayes classifier and linear discriminant analysis.
CO3	Acquire knowledge of state-of-the-art algorithms in pattern recognition research and evaluate their applicability.
CO4	Understand and compare key concepts in major approaches, including syntactic methods, to solve classification problems.
CO5	Apply pattern recognition techniques to address and solve practical real-world problems.

Course Name: B.tech Project   **Course Code:** CS499

Course Outcomes	
CO1	Proficient in project, technical skill and team management for the final year major project in computer science and engineering.
CO2	Apply advanced computer science knowledge to innovate solutions in the final year major project.
CO3	Gain hands-on experience in the software development life cycle during the final year major project.
CO4	Demonstrate proficiency in using cutting-edge tools for scalable solutions in the final year major project.
CO5	Showcase effective communication and documentation skills in reports and presentations for the final year major project.