

Computer Engineering Department: PSO, PO & CO

PROGRAMME SPECIFIC OUTCOMES (PSO):	PSO1: The ability to understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexities.
	PSO2: Find out solutions of real-life mechanical engineering problems in Thermal, manufacturing, design, robotics and automation sector.
	PSO3: Apply industrial engineering and management principles and consider public health and safety, cultural, societal, and environmental factors to work professionally in the industry or as an entrepreneur.

PROGRAM OUTCOMES (POs)	PO1: Apply the knowledge of mathematics, science, Engineering fundamentals, and an Engineering specialization to the solution of complex Engineering problems.
	PO2: Identify, formulate, review research literature and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and Engineering sciences.
	PO3: 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.
	PO4: 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.
	PO5: Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex Engineering activities with an understanding of the limitations.

	<p>PO6: 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 practices.</p>
	<p>PO7: Understand the impact of the professional Engineering solutions in societal and Environmental contexts, and demonstrate the knowledge of, and need for sustainable development.</p>
	<p>PO8: Apply ethical principles and commit to professional ethics and responsibilities and norms of Engineering practice.</p>
	<p>PO9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.</p>

PO10: 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.

PO11: Demonstrate knowledge and understanding of 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.

PO12: 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.

COURSE OUTCOMES (COs)

Subject name (Subject code):	Object Oriented Programming (210243)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Apply constructs- sequence, selection and iteration; classes and objects, inheritance, use of predefined classes from libraries while developing software.
CO 2	Design object-oriented solutions for small systems involving multiple objects.
CO 3	Use virtual and pure virtual function and complex programming situations.
CO 4	Apply object-oriented software principles in problem solving.
CO 5	Analyze the strengths of object-oriented programming.
CO 6	Develop the application using object oriented programming language (C++).

At the end of this course, the student will be able to:

Course Outcome	Course Outcome
CO 1	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
CO 2	To use appropriate algorithmic strategy for better efficiency

CO 3	To summarize data searching and sorting techniques.
CO 4	To discriminate the usage of various structures in approaching the problem solution.
CO 5	To analyze and use effective and efficient data structures insolving various Computer Engineering domain problems.
CO 6	To design the algorithms to solve the programming problems.
Subject name (Subject code):	
Computer Graphics(210244)	

At the end of this course, the student will be able to:

Course Outcome	Course Outcome
CO 1	Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics. Identify the basic terminologies of Computer Graphics and interpret the mathematical foundation of the concepts of computer graphics.
CO 2	Apply mathematics to develop Computer programs for elementary graphic operations.
CO 3	Illustrate the concepts of windowing and clipping and apply various algorithms to fill and clip polygons.

CO 4	Understand and apply the core concepts of computer graphics, including transformation in two and three dimensions, viewing and projection.
CO 5	Understand the concepts of color models, lighting, shading models and hidden surface elimination.
CO 6	Create effective programs using concepts of curves, fractals, animation and gaming.

Subject name (Subject code):	Digital Electronics and Logic Design(210245)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Simplify Boolean Expressions using K Map.
CO 2	Design and implement combinational circuits.
CO 3	Design and implement sequential circuits.
CO 4	Develop simple real-world application using ASM and PLD.
CO 5	Differentiate and Choose appropriate logic families ICpackages as per the given design specifications.
CO 6	Explain organization and architecture of computer system
Subject name (Subject code):	Engineering Mathematics III(207003)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Solve Linear differential equations, essential in modelling and design of computer-based systems.
CO 2	Apply concept of Fourier transform and Z-transform and its applications to continuous and discrete systems and image processing.

CO 3	Apply Statistical methods like correlation and regression analysis and probability theory for data analysis and predictions in machine learning.
CO 4	Solve Algebraic and Transcendental equations and System of linear equations using numerical techniques.
CO 5	Obtain Interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.
Subject name (Subject code):	Data Structures and Algorithms (210252)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Identify and articulate the complexity goals and benefits of a good hashing scheme for real-world applications.
CO 2	Apply non-linear data structures for solving problems of various domain.
CO 3	Design and specify the operations of a nonlinear-based abstract data type and implement them in a high-level programming language.
CO 4	Analyze the algorithmic solutions for resource requirements and optimization
CO 5	Use efficient indexing methods and multiway search techniques to store and maintain data.
CO 6	Use appropriate modern tools to understand and analyze the functionalities confined to the secondary storage.
Subject name (Subject code):	Software Engineering (210253)

At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO1	Analyze software requirements and formulate design solution for a software.
CO2	Design applicable solutions in one or more application domains using software engineering approaches that integrate ethical, social, legal and economic concerns.
CO3	Apply new software models, techniques and technologies to bring out innovative and novelistic solutions for the growth of the society in all aspects and evolving into their continuous professional development.
CO4	Model and design User interface and component-level.
CO5	Identify and handle risk management and software configuration management.
CO6	Utilize knowledge of software testing approaches, approaches to verification and validation
Subject name (Subject code):	Microprocessor(210254)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Exhibit skill of assembly language programming for the application.
CO 2	Classify Processor architectures.
CO 3	Illustrate advanced features of 80386 Microprocessor.

CO 4	Compare and contrast different processor modes.
CO 5	Use interrupts mechanism in applications
CO 6	Differentiate between Microprocessors and Microcontrollers.
CO 7	Identify and analyze the tools and techniques used to design,implement, and debug microprocessor-based systems.
Subject name (Subject code):	Principles of Programming Languages(210256)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Make use of basic principles of programming languages
CO 2	Able to develop a program with Data representation and Computations
CO 3	Able to develop programs using Object Oriented Programming language : Java
CO 4	Develop application using inheritance, encapsulation, and polymorphism
CO 5	Able to demonstrate Applet and Multithreading for robust application development
CO 6	Able to develop a simple program using basic concepts of Functional and Logical programming paradigm
TE COMPUTER ENGINEERING	

Subject name (Subject code):	Database Management Systems(310241)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Analyze and design Database Management System using ERmodel
CO 2	Implement database queries using database languages
CO 3	Normalize the database design using normal forms
CO 4	Apply Transaction Management concepts in real-timesituations
CO 5	Use NoSQL databases for processing unstructured data
CO 6	Differentiate between Complex Data Types and analyze theuse of appropriate data types
Subject name (Subject code):	Theory of Computation (310242)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Understand formal language, translation logic, essentials of translation, alphabets, language representation and apply it to design Finite Automata and its variants
CO 2	Construct regular expression to present regular language andunderstand pumping lemma for RE
CO 3	Design Context Free Grammars and learn to simplify thegrammar

CO 4	Construct Pushdown Automaton model for the Context Free Language
CO 5	Devise Turing Machine for the different requirements outlined by theoretical computer science
CO 6	Analyze different classes of problems, and study concepts of NP completeness
Subject name (Subject code):	Systems Programming and Operating System(310243)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Analyze and synthesize basic System Software and its functionality.
CO 2	Identify suitable data structures and Design & Implement various System Software
CO 3	To be familiar with the format of object modules, the functions of linking, relocation, and loading
CO 4	Implement and Analyze the performance of process scheduling algorithms
CO 5	Identify the mechanism to deal with deadlock and concurrency issues
CO 6	Demonstrate memory organization and memory management policies
Subject name (Subject code):	Computer Networks and Security (310244)
At the end of this course, the student will be able to:	

Course Outcome	Course Outcome
CO1	Summarize fundamental concepts of Computer Networks, architectures, protocols and technologies
CO2	Illustrate the working and functions of data link layer
CO3	Analyze the working of different routing protocols and mechanisms
CO4	Implement client-server applications using sockets
CO5	Illustrate role of application layer with its protocols, client-server architectures
CO6	Comprehend the basics of Network Security
Subject name (Subject code):	Software Project Management (310245(D))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Comprehend Project Management Concepts Projects and Management
CO 2	Use various tools of Software Project Management
CO 3	Schedule various activities in software projects
CO 4	Track a project and manage changes
CO 5	Apply Agile Project Management

CO 6	Analyse staffing process for team building and decisionmaking in Software
Subject name (Subject code):	Elective I - Internet of Things and Embedded Systems (310245(A))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Understand the fundamentals and need of Embedded Systemsfor the Internet of Things
CO 2	Apply IoT enabling technologies for developing IoT systems
CO 3	Apply design methodology for designing and implementingIoT applications
CO 4	Analyze IoT protocols for making IoT devices communication
CO 5	Design cloud based IoT systems
CO 6	Design and Develop secured IoT applications
Subject name (Subject code):	Elective I - Human Computer Interface(310245(B))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome

CO 1	Design effective Human-Computer-Interfaces for all kinds of users
CO 2	Apply and analyze the user-interface with respect to golden rules of interface
CO 3	Analyze and evaluate the effectiveness of a user-interface design
CO 4	Implement the interactive designs for feasible data search and retrieval
CO 5	Analyze the scope of HCI in various paradigms like ubiquitous computing, virtual reality, multi-media, World wide web related environments
CO 6	Analyze and identify user models, user support, and stakeholder requirements of HCI Systems
Subject name (Subject code):	Elective I - Distributed Systems (310245(C))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Analyze Distributed Systems types and architectural styles
CO 2	Implement communication mechanism in Distributed Systems
CO 3	Implement the synchronization algorithms in Distributed System applications
CO 4	Develop the components of Distributed File System
CO 5	Apply replication techniques and consistency model in Distributed Systems

CO 6	Build fault tolerant Distributed Systems
Subject name (Subject code):	Elective I - Software Project Management(310245(D))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Comprehend Project Management Concepts
CO 2	Use various tools of Software Project Management
CO 3	Schedule various activities in software projects
CO 4	Track a project and manage changes
CO 5	Apply Agile Project Management
CO 6	Analyse staffing process for team building and decisionmaking in Software Projects and Management
Subject name (Subject code):	Data Science and Big Data Analytics (3102510)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Analyze needs and challenges for Data Science Big DataAnalytics

CO 2	Apply statistics for Big Data Analytics
CO 3	Apply the lifecycle of Big Data analytics to real world problems
CO 4	Implement Big Data Analytics using Python programming
CO 5	Implement data visualization using visualization tools in Python programming
CO 6	Design and implement Big Databases using the Hadoop ecosystem
Subject name (Subject code):	Web Technology(310252)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Implement and analyze behavior of web pages using HTML and CSS
CO 2	Apply the client side technologies for web development
CO 3	Analyze the concepts of Servlet and JSP
CO 4	Analyze the Web services and frameworks
CO 5	Apply the server side technologies for web development
CO 6	Create the effective web applications for business functionalities using latest web development platforms

Subject name (Subject code):	Artificial Intelligence(310253)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Identify and apply suitable Intelligent agents for various AI applications
CO 2	Build smart system using different informed search / uninformed search or heuristic approaches
CO 3	Identify knowledge associated and represent it by ontological engineering to plan a strategy to solve given problem
CO 4	Apply the suitable algorithms to solve AI problems
CO 5	Implement ideas underlying modern logical inference systems
CO 6	Represent complex problems with expressive yet carefully constrained language of representation
Subject name (Subject code):	Elective II - Information Security (310254(A))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Model the cyber security threats and apply formal procedures to defend the attacks
CO 2	Apply appropriate cryptographic techniques by learning symmetric and asymmetric key cryptography
CO 3	Design and analyze web security solutions by deploying various cryptographic techniques along with data integrity algorithms

CO 4	Identify and Evaluate Information Security threats and vulnerabilities in Information systems and apply security measures to real time scenarios
CO 5	Demonstrate the use of standards and cyber laws to enhance Information Security in the development process and infrastructure protection
Subject name (Subject code):	Elective II - Augmented and Virtual Reality(310254(B))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Understand the basics of Augmented and Virtual reality systems and list their applications
CO 2	Describe interface to the Virtual World with the help of input and output devices
CO 3	Explain representation and rendering system in the context of Virtual Reality
CO 4	Analyze manipulation, navigation and interaction of elements in the virtual world
CO 5	Summarize the basic concepts and hardware of Augmented Reality system
CO 6	Create Mobile Augmented Reality using Augmented Reality techniques and software
Subject name (Subject code):	Elective II- Cloud Computing(310254(C))
At the end of this course, the student will be able to:	

Course Outcome	Course Outcome
CO 1	Understand the different Cloud Computing environment
CO 2	Use appropriate data storage technique on Cloud, based onCloud application
CO 3	Analyze virtualization technology and install virtualizationsoftware
CO 4	Develop and deploy applications on Cloud
CO 5	Apply security in cloud applications
CO 6	Use advance techniques in Cloud Computing
Subject name (Subject code):	Elective II - Software Modeling and Architecture(310254(D))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Analyze the problem statement (SRS) and choose proper design technique for designing web-based/ desktop application
CO 2	Design and analyze an application using UML modeling asfundamental tool
CO 3	Evaluate software architectures
CO 4	Use appropriate architectural styles and software designpatterns
CO 5	Apply appropriate modern tool for designing and modeling

Subject name (Subject code)	Design and Analysis of Algorithm(410241)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Formulate the problem
CO 2	Analyze the asymptotic performance of algorithms
CO 3	Decide and apply algorithmic strategies to solve givenproblem
CO 4	Find optimal solution by applying various methods
CO5	Analyze and Apply Scheduling and Sorting Algorithms
CO6	Solve problems for multi-core or distributed or concurrentenvironments
Subject name (Subject code):	Machine Learning (410242)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Identify the needs and challenges of machine learning for realtime applications.
CO 2	Apply various data pre-processing techniques to simplify andspeed up machine learning algorithms.

CO 3	Select and apply appropriately supervised machine learning algorithms for real time applications
CO 4	Implement variants of multi-class classifier and measure its performance.
CO 5	Compare and contrast different clustering algorithms.
CO 6	Design a neural network for solving engineering problems.
Subject name (Subject code):	Blockchain Technology (410243)
At the end of this course, the student will be able to:	
Course Outcome #	Course Outcome
CO 1	Interpret the fundamentals and basic concepts in Blockchain
CO 2	Compare the working of different blockchain platforms
CO 3	Use Crypto wallet for crypto currency-based transactions
CO4	Analyze the importance of blockchain in finding the solution to the real-world problems.
CO5	Illustrate the Ethereum public block chain platform
CO6	Identify relative application where block chain technology can be effectively used and implemented.
Subject name (Subject code):	Elective IV- Pervasive Computing(410244(A))

At the end of this course, the student will be able to:	
Course Outcome #	Course Outcome
CO 1	Demonstrate fundamental concepts in pervasive computing.
CO 2	Explain pervasive devices and decide appropriate one as per the need of real time applications.
CO 3	Classify and analyze context aware systems for their efficiency in different ICT systems.
CO4	Illustrate intelligent systems and generic intelligent interactive applications.
CO5	Design HCI systems in pervasive computing environment.
CO6	Explore the security challenges and know the role of ethics in the context of pervasive computing.
Subject name (Subject code):	Elective IV-Multimedia Techniques(410244(B))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Describe the media and supporting devices commonly associated with multimedia information and systems.
CO 2	Demonstrate the use of content-based information analysis in a multimedia information system.
CO 3	Critique multimedia presentations in terms of their appropriate use of audio, video, graphics, color, and other information presentation concepts.
CO 4	Implement a multimedia application using an authoring system.

CO 5	Understanding of technologies for tracking, navigation and gestural control.
CO 6	Implement Multimedia Internet of Things Architectures.
Subject name (Subject code):	Elective IV-Cyber Security and Digital Forensics (410244)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Analyze threats in order to protect or defend it in cyberspace from cyber-attacks.
CO2	Build appropriate security solutions against cyber-attacks.
CO3	Underline the need of digital forensic and role of digital evidences.
CO4	Explain rules and types of evidence collection
CO5	Analyze, validate and process crime scenes
CO6	Identify the methods to generate legal evidence and supporting investigation reports.
Subject name (Subject code):	Elective IV- Object oriented Modeling and Design(410244(D))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome

CO 1	Describe the concepts of object-oriented and basic class modelling.
CO 2	Draw class diagrams, sequence diagrams and interaction diagrams to solve problems.
CO 3	Choose and apply a befitting design pattern for the given problem
CO 4	To Analyze applications, architectural Styles & software control strategies
CO 5	To develop Class design Models & choose Legacy Systems.
CO 6	To Understand Design Patterns

Subject name (Subject code):	Elective IV Digital Signal Processing (410244(E))
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At the end of this course, the student will be able to:

Course Outcome	Course Outcome
CO 1	Understand the mathematical models and representations of DT Signals and Systems
CO 2	Apply different transforms like Fourier and Z-Transform from applications point of view.
CO 3	Understand the design and implementation of DT systems as DT filters with filter structures and different transforms.
CO 4	Demonstrate the knowledge of signals and systems for design and analysis of systems
CO 5	Apply knowledge and use the signal transforms for digital processing applications
CO 6	To understand Filtering and Different Filter Structures

Subject name (Subject code):	Elective V - Information Retrieval (410245(A))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Implement the concept of Information Retrieval
CO 2	Generate quality information out of retrieved information
CO 3	Apply techniques such as classification, clustering, and filtering over multimedia to analyze the information
CO 4	Evaluate and analyze retrieved information
CO 5	Understand the data in various Application and Extensions of information retrieval
CO 6	Understand Parallel information retrieving and web structure.
Subject name (Subject code):	Elective V - GPU Programming and Architecture(410245(B))
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Describe GPU architecture
CO 2	Write programs using CUDA, identify issues and debug them.

CO 3	Implement efficient algorithms in GPUs for common application kernels, such as matrix multiplication
CO 4	Write simple programs using OpenCL
CO 5	Identify efficient parallel programming patterns to solve problems
CO 6	Explore the modern GPUs architecture and its Applications.
Subject name (Subject code):	Elective V- Mobile Computing(410245)
At the end of this course, the student will be able to:	
Course Outcome	Course Outcome
CO 1	Develop a strong grounding in the fundamentals of mobile Networks
CO 2	Apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network
CO 3	Illustrate Global System for Mobile Communications
CO 4	Use the 3G/4G technology based network with bandwidth capacity planning, VLR and HLR identification algorithms
CO5	Classify network and transport layer of mobile communication
CO6	Design & development of various wireless network protocols using simulation tools
Subject name (Subject code):	Elective V - Software Testing and Quality Assurance(410245 (D))

At the end of this course, the student will be able to:

Course Outcome	Course Outcome
CO 1	Describe fundamental concepts in software testing such as manual testing, automation testing and software quality assurance.
CO 2	Design and Develop project test plan, design test cases, test data, and conduct test operations.
CO 3	Apply recent automation tool for various software testing for testing software.
CO 4	Apply different approaches of quality management, assurance, and quality standard to software system.
CO 5	Apply and analyze effectiveness Software Quality Tools.
CO 6	Apply tools necessary for efficient testing framework.

Subject name (Subject code):	Elective V - Compilers (410252(E))
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At the end of this course, the student will be able to:

Course Outcome	Course Outcome
CO 1	Design and implement a lexical analyzer using LEX tools
CO 2	Design and implement a syntax analyzer using YACC tools
CO 3	Understand syntax-directed translation and run-time environment
CO 4	Generate intermediate codes for high-level statements.

CO 5	Construct algorithms to produce computer code.
CO 6	Analyze and transform programs to improve their time and memory efficiency

