Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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.
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.
5. **Modern tool usage:** 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.
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.
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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
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.
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.

COs of the First Year B.E. (ALL)

Semester-I

1A1 Engineering Mathematics-I

CO1	Understand algebraic problems from practical point of view and be able to find their solutions.
CO2	Understand maxima and minima concept.
CO3	Solve differential equations of certain type for use in same or higher semesters.
CO4	Understand series and sequence skill necessary for an engineer.
CO5	Develop mathematical skills necessary for an Engineer.
CO6	Use Mathematics as basic tool for engineering solutions.

IA2 Engineering Physics

CO1	Understand Electromagnetic phenomena and wave propagation.
CO2	Learn about Interferometric techniques in metrology, communication.
CO3	Apply quantum physics to optical & electrical phenomena.
CO4	Learn about application of lasers and Fiber Optics in Engineering and Technology.
CO5	Understand the phenomenon of conducting, superconducting and dielectric materials.
CO6	Learn about semi conducting and new engineering materials.
CO7	Apply and know about ultrasonic, acoustics.

IA3 Engineering Mechanics

CO1	Understand the vector and scalar representation of forces and moments, static equilibrium.
CO2	Know about the principle of work and energy.
CO3	Learn the effect of friction on equilibrium.
CO4	Conceptualize the laws of motion, the kinematics of motion and their interrelationship.
CO5	Understand the dynamic equilibrium equation.

IA4 Engineering Graphics

CO1	Understand the vector and scalar representation of forces and moments, static equilibrium.
CO2	Know about the principle of work and energy.
CO3	Learn the effect of friction on equilibrium.
CO4	Conceptualize the laws of motion, the kinematics of motion and their interrelationship.
CO5	Understand the dynamic equilibrium equation.

Semester-II

1B1 Engineering Mathematics-II

CO1	Understand beta gamma function and theory.
CO2	Understand double and triple integration and enable them to handle integrals of higher orders.
CO3	Develop innovative methods maxima and minima and Lagrange's equation.
CO4	Understand partition method rank of matrix eigen value and vector.
CO5	Understand differentiation under integral sign and curve tracing.
CO6	Understand basic concepts of applied mathematics to improve logical concepts.
CO7	Understand beta gamma function and theory.
CO8	Understand double and triple integration and enable them to handle integrals of higher orders.

1B2 Engineering Chemistry

CO1	Develop the understanding of Technology involved in improving quality of water for its industrial use.
CO2	Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.
CO3	Apply their knowledge for protection of different metals from corrosion
CO4	Apply the basic concepts of electro analytical techniques that facilitate rapid and reliable measurements.
CO5	Develop the understanding of Chemical structure of polymers and its effect on their various properties when used as engineering materials. Understanding the applications of specific polymers.
CO6	Impart the knowledge of fossil fuels and derived fuels with its properties and applications.
CO7	Develop the knowledge of modern chemistry of Carbon and Hydrogen used in advanced nanotechnology.
CO8	Illustrate the principles involved in corrosion reactions and techniques used for preventing it

1B3 Basic Electrical Engineering

CO1	Learn the basic concept of D.C. Electrical Circuits and different theorem.
CO2	Understand the concept of magnetic circuits.
CO3	The students will be able to solve problems of A.C. Fundamental.
CO4	Learn about three phase A.C.Circuit.
CO5	Know about the operating principle of Transformer.
CO6	Understand the construction and technical characteristics of D.C. Motor.
CO7	Know about the working of various measuring instruments.
CO8	Acquire knowledge about necessity and importance of eartthing.

1B4 Computer Programming

CO1	To explain fundamental concepts of computer and computing.
CO2	To test and execute the programs and correct syntax and logical errors.
CO3	To implement conditional branching, iteration and recursion.
CO4	To use arrays, pointers and structures to formulate algorithms and programs.
CO5	To recognize various problem solving techniques and computer applications.
CO6	To apply programming concepts to solve real life problems.
CO7	To explain fundamental concepts of computer and computing.
CO8	To test and execute the programs and correct syntax and logical errors.

PSOs and COs of the Computer Science & Engg. Department

Program Specific Outcomes (PSOs)

PSO1	An ability to design a software system, components, processes and their interfaces to meet desired needs within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturing and sustainability.
PSO2	Ability to design, implement and evaluate secure hardware and /OR software systems with assured quality and efficiency.
PSO3	Skills to use modern engineering tools, software and equipment to analyze automation problems.
PSO4	An ability to analyze, identify, formulate and solve the real life problems; design algorithms, code the programs and conduct experiments with computer systems, analyze and interpret relevant data.

Course Outcome (Cos)

Semester-III

3KS01 Engineering Mathematics-III

CO1	Understand ordinary differential equation.
CO2	Learn about Laplace transformation and its applications.
CO3	Understand PDEs of n^{th} order with constant coefficients.
CO4	Learn about Numerical Methods.
CO5	Understand the concept of Complex variables.
CO6	Understand the concept of Statistics.

3KS02 Discrete Structures & Graph Theory

CO1	Analyze and express logic sentence in terms of predicates, quantifiers, and logical connectives.
CO2	Derive the solution for a given problem using deductive logic and prove the solution based on logical inference.
CO3	Classify algebraic structure for a given mathematical problem.
CO4	Perform combinatorial analysis to solve counting problems.
CO5	Develop the given problem as graph net works and solve with techniques of graph theory
CO6	Analyze and express logic sentence in terms of predicates, quantifiers, and logical connectives.

3KS03 Object Oriented Programming

CO1	Apply Object Oriented approach to design software.
CO2	Implement programs using classes and objects.
CO3	Specify the forms of inheritance and use them in programs.
CO4	Analyze polymorphic behavior of objects.
CO5	Design and develop GUI programs.
CO6	Develop Applets for web applications.

3KS04 Data Structures

CO1	Apply various linear and nonlinear data structures
CO2	Demonstrate operations like insertion, deletion, searching and traversing on various data structures
CO3	Examine the usage of various structures in approaching the problem solution.
CO4	Choose appropriate data structure for specified problem domain

3KS05 Analog and Digital Electronics

CO1	Explain basic concepts of semiconductor devices and its application.
CO2	Compare different Number System and basics of conversion of number systems.
CO3	Realize different minimization technique to obtain minimized expression.
CO4	Design Combinational Circuits.
CO5	Design and Develop Sequential Circuits.
CO6	Explain basic concepts of semiconductor devices and its application.

Semester-IV

4KS01 Artificial Intelligents

CO1	Explain concepts of Artificial Intelligence and different types of intelligent agents and their architecture.
CO2	Formulate problems as state space search problem & efficiently solve them.
CO3	Summarize the various searching techniques, constraint satisfaction problem and example problems - game playing techniques.
CO4	Apply AI techniques in applications which involve perception, reasoning and learning.
CO5	Compare the importance of knowledge, types of knowledge, issues related to knowledge acquisition and representation.

4KS02 Data Communication & Networking

CO1	Describe data communication Components, Networks, Protocols and various topology based network architecture
CO2	Design and Test different encoding and modulating techniques to change digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion,
CO3	Explain the various multiplexing methods and evaluate the different error detection & correction techniques.
CO4	Illustrate and realize the data link control and data link protocols.
CO5	Describe and demonstrate the various Local area networks and the IEEE standards.

4KS03 Operating System

CO1	Describe data communication Components, Networks, Protocols and various topology based network architecture
CO2	Design and Test different encoding and modulating techniques to change digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion,
CO3	Explain the various multiplexing methods and evaluate the different error detection & correction techniques.
CO4	Illustrate and realize the data link control and data link protocols.
CO5	Describe and demonstrate the various Local area networks and the IEEE standards.

4KS04 Microprocessor and Assembly Language Programming

CO1	Describe 8086 microprocessor and its architecture; also understand instruction processing during thefetch-decode-execute cycle.
CO2	Design and Test assembly language programs using 8086 microprocessor instruction set.
CO3	Demonstrate the implementation of standard programming constructs, including control structures andfunctions, in assembly language.
CO4	Illustrate and realize the Interfacing of memory & various I/O devices with 8086 microprocessor.
CO5	Explain the basic concepts of Internet of Things

4KS05 Theory of Computation

CO1	To construct finite state machines to solve problems in computing.
CO2	To write regular expressions for the formal languages.
CO3	To construct and apply well defined rules for parsing techniques in compiler
CO4	To construct and analyze Push Down, Turing Machine for formal languages
CO5	To express the understanding of the Chomsky Hierarchy.

Semester-V

5KS01Database Management Systems

CO1	Model, design and normalize databases for real life applications.
CO2	Discuss data models, conceptualize and depict a database system using ER diagram.
CO3	Query Database applications using Query Languages like SQL.
CO4	Design & develop transaction processing approach for relational databases.
CO5	Understand validation framework like integrity constraints, triggers and assertions.
CO6	Model, design and normalize databases for real life applications.

5KS02 Compiler Design

CO1	Describe the fundamentals of compiler and various phases of compilers.
CO2	Design and implement LL and LR parsers
CO3	Solve the various parsing techniques like SLR, CLR, LALR.
CO4	Examine the concept of Syntax-Directed Definition and translation.
CO5	Assess the concept of Intermediate-Code Generation and run-time environment
CO6	Explain the concept code generation and code optimization.

5KS03 Computer Architecture & Organization

CO1	Discuss basic structure of computer.
CO2	Understand the basic operation of CPU.
CO3	Compare and select various Memory and I/O devices as per requirement.
CO4	Solve the concepts of number representation and their operation.
CO5	Explain the concept of parallel processing and pipelining.
CO6	Discuss basic structure of computer.

5KS04 PE-I Cognitive Technologies

CO1	Describe the Cognitive computing and principles of cognitive systems.
CO2	Identify role of Natural Language Processing in cognitive system.
CO3	Outline application of advanced analytics in cognitive computing.
CO4	Justify role of Cloud and Distributed Computing in Cognitive Computing.
CO5	Assess the process of building a Cognitive Application.
CO6	Identify the Emerging Areas and Future Applications of Cognitive Computing

5KS05 PE-I Data Science & Statistics

CO1	Demonstrate proficiency with statistical analysis of data.
CO2	Build skills in transformation and merging of data for use in analytic tools.
CO3	Perform linear and multiple linear regression analysis.
CO4	Develop the ability to build and assess data-based models.
CO5	Evaluate outcomes and make decisions based on data.

5KS05 PE-I Internet of Things

CO1	Understand the basics of IoT
CO2	Understand design methodology and platforms involved in IoT
CO3	Apply the knowledge to interface various sensors with IoT development
CO4	Design and Implement IoT system for real time application

5KS05 PE-I Introduction to Cyber Security

CO1	Know fundamentals of Cybercrimes and Cyber offenses
CO2	Realize the Cyber threats, attacks and Vulnerabilities.
CO3	Explore the industry practices and tools.
CO4	Comprehend the Access Control and Authentication Process.
CO5	Implement Intrusion Detection and Prevention

5KS05 OE-I Principals of Marketing for Engineers

CO1	Identify the importance of the digital marketing for marketing success
CO2	Manage customer relationships across all digital channels and build better customer relationships
CO3	Create a digital marketing plan
CO4	Identify digital channels

5KS05 OE-I Fundamentals of Finance and Accounting

CO1	Define bookkeeping and accounting
CO2	Explain the general purposes and functions of accounting
CO3	Explain the differences between management and financial accounting
CO4	Describe the main elements of financial accounting information – assets, liabilities, revenue and expenses
CO5	Identify the main financial statements and their purposes

5KS05 OE-I Entrepreneurship

CO1	Analyse the business environment in order to identify business opportunities,
CO2	Identify the elements of success of entrepreneurial ventures
CO3	Evaluate the effectiveness of different entrepreneurial strategies
CO4	Specify the basic performance indicators of entrepreneurial activity
CO5	Explain the importance of marketing and management in small businesses venture
CO6	Interpret their own business plan

Semester-VI

6KS01Security Policy And Governance

CO1	List and discuss the key characteristics of Information Security, Leadership and Management
CO2	Differentiate between Law and Ethics
CO3	Describe why ethical codes of conduct are important to Information Security
CO4	Discuss the importance, benefits and desired outcomes of Information Security Governance
CO5	Discuss the process of developing, implementing and maintaining various types of Information Security Policies.
CO6	Define Risk Management and its role in the organization

6KS02 Design and Analysis of Algorithms

CO1	Carry out the analysis of various Algorithms for mainly Time complexity.
CO2	Apply design principles and concepts to algorithm design.
CO3	Understand different algorithmic design strategies.
CO4	Analyze the efficiency of algorithms using time complexity.
CO5	Apply the standard sorting algorithms

6KS03 Software Engineering

CO1	Decide on a process model for a developing a software project
CO2	Classify software applications and identify unique features of various domains
CO3	Design test cases of a software system.

CO4	Understand basics of Project management.
CO5	Plan, schedule and execute a project considering the risk management.
CO6	Apply quality attributes in software development life cycle.
CO7	Understand quality control and to ensure good quality software

6KS04 PE-IINatural Language and Processing

CO1	Understand how to tag a given text with basic Language features
CO2	Design an innovative application using NLP components
CO3	Implement a rule-based system to tackle morphology/syntax of a language
CO4	Design a tag set to be used for statistical processing for real-time applications
CO5	Compare and contrast the use of different statistical approaches for different types of NLP applications.

6KS04 PE-II Big Data Analytics

CO1	Work with big data tools and its analysis techniques.
CO2	Analyze data by utilizing clustering and classification algorithms.
CO3	Learn and apply different algorithms and recommendation systems for large volumes of data.
CO4	Perform analytics on data streams.
CO5	Learn NoSQL databases and management.

6KS04 PE-II Sensors and Actuators

CO1	Fabricate some of those sensors
CO2	Simulate sensors and characterize before fabricating it
CO3	Design application with sensors and actuators for real world

6KS04 PE-II Cryptography

CO1	Classify the symmetric encryption techniques
CO2	Evaluate the authentication and hash algorithms.
CO3	Discuss authentication applications
CO4	Summarize the intrusion detection and its solutions to overcome the attacks.
CO5	Understand basic concepts of system level security
CO6	Illustrate various public key cryptographic techniques

6KS05 OE-II Computational Biology

CO1	Understand what types of biological questions can be investigated using computers, and what limitations computational methods impose on the understanding of biology.
CO2	Describe the properties of DNA, RNA, and proteins, the relationships among these molecules.
CO3	Analyze how to convert a biological question into a computational problem that can be solved using computers.
CO4	Explain general approaches for solving computational problems, and will be able to apply these approaches to new problems you encounter.
CO5	Understand how implement the algorithms by writing computer programs.

6KS05 OE-II Cyber Laws and Ethics

CO1	Understand Cyber Space, Cyber Crime, Information Technology, Internet& Services.
CO2	List and discuss various forms of Cyber Crimes
CO3	Explain Computer and Cyber Crimes
CO4	Understand Cyber Crime at Global and Indian Perspective.
CO5	Describe the ways of precaution and prevention of Cyber Crime as well as Human Rights

6KS05 OE-II Intellectual Property Right

CO1	Demonstrate a breadth of knowledge in Intellectual property.
CO2	Assess fundamental aspects of Intellectual Property Rights.
CO3	Discuss Patents, Searching, filling and drafting of Patents
CO4	Discuss the basic principles of geographical indication, industrial designs, and copyright.
CO5	Explain of Trade Mark and Trade Secret.
CO6	Investigate current trends in IPR and Government initiatives in fostering IPR.

Semester-VII

7KS01 Digital Signal Processing

CO1	Understanding the mathematical operation on Digital signal
CO2	Sketch the magnitude and phase response of DFT, Inverse DFT and FFT of discrete time signals.
CO3	Calculate linear and circular convolution of discrete sequences.
CO4	Implement Z transform and inverse Z transform of discrete signals
CO5	Model IIR and FIR filter using window techniques
CO6	Sketch the magnitude and phase response of DFT, Inverse DFT and FFT of discrete time signals.

7KS02 Computer Networks

CO1	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission
CO2	Apply channel allocation, framing, error and flow control techniques.
CO3	Describe the functions of Network Layer i.e. Logical addressing, subnetting& Routing Mechanism. Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism
CO4	Explain the functions offered by session and presentation layer and their Implementation
CO5	Explain the different protocols used at application layer i.e. HTTP, SNMP, SMTP, FTP, TELNET and VPN
CO6	Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission

7KS03 Design And Analysis Of Algorithms

CO1	Argue the correctness of algorithms using inductive proofs and invariants.
CO2	Analyze worst-case running times of algorithms using asymptotic analysis.
CO3	Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it
CO4	Explain what amortized running time is and what it is good for. Describe the different methods of amortized analysis
CO5	Explain what competitive analysis is and to which situations it applies. Perform competitive analysis.
CO6	Compare between different data structures. Pick an appropriate data structure for a design situation.

7KS04 Object Oriented Analysis And Design

CO1	Ability to analyze and model software specifications.
CO2	Ability to abstract object-based views for generic software systems.
CO3	Ability to deliver robust software components.

7KS05 Professional Elective – I Computer Graphics

CO1	Understand the basics of computer graphics, different graphics systems and applications of computergraphics.
CO2	Discuss various algorithms for scan conversion and filling of basic objects and their comparativeanalysis.
CO3	Use of geometric transformations on graphics objects and their application in compositeform.
CO4	Extract scene with different clipping methods and its transformation to graphics displaydevice.
CO5	Explore projections and visible surface detection techniques for display of 3D scene on 2Dscreen.
CO6	Render projected objects to naturalize the scene in 2D view and use of illumination models forthis.

7KS05 Professional Elective – I Web Engineering

CO1	Discuss the insights of internet programming and implement complete application over theweb.
CO2	Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Stylesheet.
CO3	Utilize the concepts of JavaScript andJava
CO4	Use web application development software tools i.e. Ajax, PHP and XML etc. and identify the environments currently available on the market to design websites

Semester-VIII

8KS01 Artificial Intelligence

CO1	Solve basic AI based problems**.**
CO2	Define the concept of Artificial Intelligence.
CO3	Apply AI techniques to real world

8KS02 EmbeddedSystems

CO1	Acquire a basic knowledge about fundamentals of microcontrollers .
CO2	Acquire a basic knowledge about programming and system control to perform a specific task.
CO3	Acquire knowledge about devices and buses used in embedded systems.
CO4	Develop programming skills in embedded systems for various applications.
CO5	Acquire knowledge about basic concepts of circuit emulators.

8KS03 Software Engineering

CO1	Plan a software engineering process life cycle
CO2	Able to elicit
CO3	Analyze and translate a specification into a design
CO4	Know how to develop the code from the design and effectively apply relevant standards and perform testing
CO5	Able to use modern engineering tools necessary for software project management
CO6	Plan a software engineering process life cycle

8KS03 Software Engineering

CO1	Plan a software engineering process life cycle
CO2	Able to elicit
CO3	Analyze and translate a specification into a design
CO4	Know how to develop the code from the design and effectively apply relevant standards and perform testing
CO5	Able to use modern engineering tools necessary for software project management
CO6	Plan a software engineering process life cycle

8KS04 PE II Network Security

CO1	Understand and explore the basics of Computer Networks and Various Protocols
CO2	Administrate a network and schedule flow of information
CO3	Examine the network security issues in Mobile and ad hoc networks.
CO4	Demonstrate the TCP/IP and OSI fashions with merits and demerits

8KS05 Project & Seminar

CO1	Design solutions for given engineering problem.
CO2	Demonstrate practical knowledge by constructing models/algorKShms for real time applications
CO3	Express effectively in wrKSten and oral communication
CO4	ExhibKS the skills to work in a team.
CO5	Prepare a time chart and financial record for execution of the project
CO6	Personal competences of students are reinforced most during the Final Year Project process, including the preparation, elaboration, presentation and defense stage
CO7	Final Year Projects represent the culmination of study towards the Bachelor of Engineering degree. Projects offer the opportunKSy to apply and extend material learned throughout the program. Assessment is by means of a seminar presentation, submission of a thesis, and a public demonstration of work undertaken.

PSOs and COs of the Information Technology Department

Program Specific Outcomes (PSOs)

PSO1	Understand the core features of Information Technology to contribute effectively to the needs of industry and the society.
PSO2	Gain capabilities in technologies used particularly in the sectors of communications, networking and software development.
PSO3	Develop, analyze, and design IT solutions and awareness about basic soft skills necessary for working in community and professional teams.
PSO4	Ability to pursue higher studies or get placed in IT based companies or Government organizations

Course Outcome (Cos)

Semester-III

3IT01 Engineering Mathematics-III

CO1	Demonstrate the knowledge of differential equations and linear differential equations
CO2	Apply Laplace transform to solve differential equations
CO3	Demonstrate the use of Fourier Transform to connect the time domain and frequency domain
CO4	Demonstrate the basic concepts of probability and statistics.
CO5	Apply the knowledge of Complex Analysis.
CO6	Apply the knowledge of vector calculus to solve physical problems.

3IT02 Ddiscrete Structures & Graph Theory

CO1	Identify basic terminology of Mathematical Logic, Theory of inference & Predicate calculus.
CO2	Identify, illustrate, and solve engineering problems on the basis of set theory
CO3	Identify and Design an Algebraic Structures and groups
CO4	Examine and formulate the concept of Lattices & Boolean Algebra to solve engineering problems
CO5	Design and interpret data using graphs, trees and related algorithms

3IT03 Object Oriented Programming

CO1	Apply Object Oriented approach to design software
CO2	Implement programs using classes and objects.
CO3	Specify the forms of inheritance and use them in programs.
CO4	Analyze polymorphic behavior of object
CO5	Design and develop GUI programs.
CO6	Develop Applets for web applications

3IT04 Assembly Language Programming

CO1	To draw and explain internal architecture of 8086 with its register organization
CO2	Able apply instruction format 7 addressing modes in 8086 programming
CO3	Able to apply control flow instruction in 8086 programming through use of any Open Source Software.(TASM,NASM etc.)
CO4	Able to apply stack & subroutine concept in 8086 programming.

3IT05 Aanalog and Digital Electronics

CO1	Understand the basic applications of BJT.
CO2	Get acquainted with analog ICs like Op-Amp IC-741 and Timer IC-555
CO3	Discriminate the working of sinusoidal and non-sinusoidal waveform generators
CO4	Apply the concept of K-map to simplify logic expressions
CO5	Design and implement Combinational circuits
CO6	Explore the applications of Sequential circuits

Semester-IV

4IT01 Computer Organization & Architecture

CO1	Ability to understand the basic structure of computer including functional units, addressing modes, stacks,
CO2	Ability to understand the basic processing unit of computer, execution of a complete instruction
CO3	Ability to understand about input/output organization of computer including interrupt, DMA, buses
CO4	Ability to understand the concepts of RAM, ROM, cache memory, virtual memory
CO5	Ability to understand number representation, Booth's algorithm, different peripheral devices.

4IT02 Data Communication & Networking

CO1	On completion of the course learner will be able to-
CO2	Understand the principles and fundamental concept of computer networks
CO3	Understand and explain data communication system with its techniques and applications
CO4	Identify various error detection and correction techniques in data transmission
CO5	Evaluating the network addresses and learning routing mechanism protocols
CO6	Design TCP connection and analyze upper OSI layer functions and services.
CO6	Explore the network design and its applications to digital world

4IT03 Operating System

CO1	Fundamental understanding of the role of Operating Systems, concept of a process and thread
CO2	To apply the concept of process scheduling and concurrency control to different scenarios
CO3	To understand and apply the concept deadlock and basic Memory Management
CO4	To understand and apply the concept deadlock and basic Memory Management
CO5	To realize the concept of File system management.
CO6	To understand and apply the concept of Disk Management, Scheduling and Protection and Security.

4IT04 Data Structure

CO1	Define fundamental features of array, linked-list, stack, queue, tree and graph
CO2	Write the algorithms to perform various operations such as: Search, Insertion, Deletion, Sort etc
CO3	Implement algorithms for various operations on linear and non-linear data structure
CO4	Classify the linear data structures such as Array, Linked-List, Stack, Queue and non-linear data Structures such
CO5	Implement linear data structures: Array, Linked-list, Stack, Queue using suitable language C,C++
CO6	Implement non-linear data structure: Tree, Graph using C or C++
CO7	know different types of sorting methods and their algorithms
CO8	Choose appropriate algorithm for Searching 9: Perform operations of traverse, insertion, deletion.

Semester-V

5IT01 Database Management System

CO1	To understand concept of database system
CO2	To understand and apply the concept related with data model
CO3	Apply concepts of database querying, integrity and security using SQL.
CO4	To understand query processing and query optimization
CO5	To understand concept of transaction management and its properties
CO6	To understand the concept of Concurrency control and study of various database protocols

5IT02 Theory Of Computation

CO1	To construct finite state machines to solve problems in computing
CO2	To write regular expressions for the formal languages
CO3	To construct and apply well defined rules for parsing techniques in compiler
CO4	To construct and analyze Push Down, Turing Machine for formal languages
CO5	To express the understanding of the Chomsky Hierarchy.
CO6	To express the understanding of the decidability and un-decidability problems.

5IT03 Software Engineering

CO1	To identify unique features of various software application domains and classify software applications.
CO2	Ability to understand the basic processing unit of computer, execution of a complete instruction

CO3	To analyze software requirements by applying various modeling techniques
CO4	To describe principles of agile development, discuss the SCRUM process and distinguish agile processmodel from other process models
CO5	To understand IT project management through life cycle of the project and future trends in IT ProjectManagement

5IT04 Professional Elective - I (i) Information Security System

CO1	Study the foundational theory behind information security
CO2	Discuss the basic information security.
CO3	Illustrate the legal, ethical and professional issues
CO4	Discuss the aspects of risk management.
CO5	Summarize various standards for information security
CO6	Explain the security techniques

5IT04 Professional Elective - I (ii) Data Science & Statistic

CO1	Gain knowledge about basic concepts of Data Science & Statistics
CO2	Demonstrate proficiency with statistical analysis of data
CO3	Analyze statistical data graphically using frequency distributions and cumulative frequency distributions.
CO4	Develop the ability to build and assess data-based models
CO5	Evaluate models generated from data

5IT04 Professional Elective - I (III) Internet Of Things

CO1	To design small scale as well as sophisticated embedded system.
CO2	To implement standalone application and GUI based application for real life projects.
CO3	To recognize the role of professional societies in providing solution for real world problem.

5IT05 Open Elective - I (II) Cyber Law & Ethics

CO1	Understand Cyber laws
CO2	Describe Information Technology act and Related Legislation
CO3	Demonstrate Electronic business and legal issues.
CO4	Interpret Cyber Ethics

Semester-VI

6IT01 Compiler Design

CO1	Describe the fundamentals of compiler and various phases of compilers
CO2	Design and implement LL and LR parsers
CO3	Solve the various parsing techniques like SLR, CLR, LALR
CO4	Examine the concept of Syntax-Directed Definition and translation
CO5	Assess the concept of Intermediate Code Generation and run-time environment
CO6	Explain the concept code generation and code optimization.

6IT02 Design & Analysis of Algorithm

CO1	Analyze worst-case running times of algorithms using asymptotic analysis
CO2	Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it.
CO3	Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.
CO4	Describe the greedy paradigm and explain when an algorithmic design situation calls for it
CO5	Able to understand the concept of Backtracking, Polynomial Time & Non Polynomial Time Algorithms.

6IT03 Artificial Intelligence

CO1	Encryption Algorithms.
CO2	Understand IP Security system and protocols
CO3	Identify and understand Network Security controls
CO4	Explore web and system security and its applications to digital world.

6IT04 Professional Elective - II (II) Big Data Analytic

CO1	Understand the key issues in big data management and its associated applications in intelligent business andscientific computing.
CO2	Acquire fundamental enabling techniques like Hardtop, and NO SQL in big data analytics
CO3	Achieve basic knowledge and operations of Map-Reduce
CO4	Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.
CO5	Implement algorithms for Clustering, Classifying and finding associations in Big Data
CO6	Achieve adequateperspectives of big data analytics in various applications like recommender systems, social media applications

6IT04 Professional Elective - II (III) Sensors & Actuators

CO1	Concept behind working of measurement systems and different types of sensors and actuators
CO2	Understanding of electric and magnetic sensors and actuators and their applications
CO3	Understanding of optical sensors and other sensors and their applications
CO4	Understanding of smart sensors and their uses.

6IT05 Open Elective II (I) Economic Policy In India

CO1	Student will be able to explain, elaborate and indentify the impact of external sector on Indian economy
CO2	Student will be able to explain, elaborate and indentify the impact monetary and fiscal policies in India
CO3	Student will be able to explain ,elaborate and analyze the issues of Indian economy

Semester-VII

7IT01 Compiler Design

CO1	Gain knowledge of basic concepts of Mobile Computing and Principals of cellular communication.
CO2	Understand different components, devices for mobile computing and understand wireless application protocol
CO3	Able to implement different concepts of mobile computing fundamentals using wireless scripting language.
CO4	To develop ability for developing open platform mobile development.
CO5	Explore concepts of distributed mobile computing
CO6	Identify & understand different security issues in mobile computing.

7IT02 Embedded System

CO1	Describe the basic structural units of a processor as well as hardware units of embedded Systems.
CO2	Explain architecture of microcontroller, and processor-memory organization for embedded system.
CO3	Use knowledge of programming to do embedded programming in various languages and use of data structures for programming
CO4	Examine the basic concepts of operating systems with real-time operating systems aspects.
CO5	Assess the Real-Time Operating System programming concepts with Design examples and case studies
CO6	Design embedded systems based various applications using embedded software development process and tools

7IT03 Cloud Computing

CO1	Describe the fundamental concept, architecture and applications of Cloud Computing
CO2	Discuss the problems related to cloud deployment model
CO3	Examine the concept of virtualization
CO4	Identify the role of network connectivity in the cloud
CO5	Assess different Cloud service providers
CO6	Inspect the security issues in cloud service models

7IT04(PE-III) (i) Machine Learning

CO1	Understand the concept of Machine Learning
CO2	Understand how to evaluate models generated from
CO3	Implement the variety of algorithms for Supervised Learning
CO4	Implement the variety of algorithms for Unsupervised Learning
CO5	Implement the variety of algorithms for Reinforcement Learning
CO6	Understand the concept of Neural Network

7IT04 (PE-III) (ii) Data Warehousing & Mining

CO1	Be familiar with basic concepts of Data Warehousing and OLAP operations.
CO2	Understand the principal of data warehousing and data preprocessing
CO3	Identify appropriate data mining algorithm to solve real world problems.
CO4	Characterize the kind of patterns that can be discovered by association rules.
CO5	Understand various classification and clustering technique and tools.
CO6	Describe complete data types with respect to spatial and web mining.

7IT04 (PE-III) (iii)Wireless Sensor Networks

CO1	Understand basic building blocks & concepts of Wireless Sensor Networks
CO2	Design wireless sensor networks for a given application
CO3	Understand emerging research areas in the field of sensor networks
CO4	Understand MAC protocols used for different communication standards used in WSN
CO5	Explore new protocols for WSN
CO6	Understand architectures of Wireless Sensor Networks, its related hardware and protocols
CO7	Familiarized with deployment and configuration methods
CO8	Get acquainted to Node-level Software Platforms

7IT05 (PE-IV) (i) Block-chain Fundamentals

CO1	Understand the technology components of Block chain and how it works behind the scenes.
CO2	Identify different approaches to developing decentralized applications
CO3	Understand Bit coin and its limitations by comparing with other alternative coins.
CO4	Devise solution using the Ethereal model.
CO5	Understand and use Hyper ledger and its development framework.
CO6	Track alternative Block chains and emerging trends in Block chain.

7IT05 (ii) Business Intelligence

CO1	To obtain sound knowledge of the theory and concepts that are required for a Business Intelligent System
CO2	To understand the various business problems and design various models that help in making business decisions
CO3	To understand and implement the mathematical concepts to develop data centric decision models.
CO4	To generate various dashboards that will help explain the Business Problem to stakeholders at different levels of the business process.

7IT05 (PE-IV) (iii) Digital Forensic

CO1	Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.
CO2	To be well-trained as next-generation computer crime investigators
CO3	Explain the methodology of incident response and various security issues in ICT world, and identify digital forensic tools for data collection
CO4	Recognize the importance of digital forensic duplication and various tools for analysis to achieve adequate perspectives of digital forensic investigation in various applications /devices like Windows/Unix system.
CO5	Apply the knowledge of IDS to secure network and performing router and network analysis
CO6	Apply the knowledge of IDS to secure network and performing router and network analysis

Semester-VIII

8IT01 Object Oriented Analysis and Design

CO1	To understand concept of Object oriented modeling
CO2	To analyses the concept of Unified Modeling Language (UML) for representation of an object oriented system
CO3	To learn software development using Object oriented approach.

8IT02 Professional Ethics and Management

CO1	Ability to Distinguish between ethical and non ethical situations
CO2	The student should be able to apply engineering ethics in the society & environment
CO3	Infer the moral judgment & correlate the concepts in addressing the ethical dilemmas
CO4	Resolve the moral issues in the profession
CO5	Relate the code of ethics to social experimentation
CO6	Able to apply risk and safety measures in various engineering fields
CO7	Develop concepts based on moral issues and enquiry
CO8	Discuss ethical issues related to engineering & realize the responsibilities and rights
CO9	Develop cognitive skills in solving social problems

8IT03 Project Management & Entrepreneurship

CO1	Gain knowledge on opportunities / ideas screening
CO2	Gain knowledge on basic entrepreneurial issues Develop critical thinking skills to solve real life Entrepreneurship and SME problems
CO3	Develop critical thinking skills to solve real life Entrepreneurship and SME problems
CO4	Develop critical thinking skills on developing a career as entrepreneurs

8IT04 (PE-V) (i) Robotics

CO1	Be familiar with basic concepts of Robot.
CO2	Understand the use of various types of End of Effectors and Sensors
CO3	Get appropriate knowledge in Robot Kinematics and Programming.
CO4	Understand the Robot safety issues and economics

8IT04 (PE-V) (ii) Virtual and Augmented reality

8IT04 (PE-V) (iii) Human Computer Interaction

CO1	Understand the principles and fundamental concept of Human Computer Interaction.
CO2	To learn Model based designs and graphical user interfaces in HCI.
CO3	Evaluate various research methods and task modeling analysis in HCI
CO4	Design effective HCI for mobile phone interface
CO5	Explore the HCI implications for designing multimedia/ ecommerce/e learning Web sites.
CO6	To Understand Cognitive Architecture and Evaluate the design case studies.

8IT04 (PE-V) (iv) Cross-Platform Development

CO1	Be familiar with different cross platform mobile application development tools
CO2	Get appropriate knowledge of Object-oriented programming concepts.
CO3	Learn fundamental concepts of flutter
CO4	Declare and construct UI
CO5	Understand layout management in widget
CO6	Design and develop cross platform application

PSOs and COs of the Electronics & Telecomm. Engg. Deptt.

Program Specific Outcomes (PSOs)

PSO1	An ability to apply the knowledge of core Electronic & Tele-communication engineering subjects with recent trends and technologies for analysis of real time problems.
PSO2	An ability to design and implement an application oriented engineering system using signal processing, embedded systems, communications engineering, and instrumentation & control systems.
PSO3	An ability to apply the knowledge of core Electronic & Tele-communication engineering subjects with recent trends and technologies for analysis of real time problems.
PSO4	Ability to pursue higher studies or get placed in IT based companies or Government organizations

Course Outcome (Cos)

Semester-III

3ETC01 Engineering Mathematics-III

CO1	Demonstrate the knowledge of differential equations to solve engineering problems of analog systems.
CO2	Apply Laplace transform to solve differential equations.
CO3	Apply knowledge of vector calculus.
CO4	Comprehend knowledge of complex analysis in terms of complex variables, harmonic functions and conformal mapping.
CO5	Apply numerical methods to obtain approximate solutions to mathematical problems.
CO6	Identify and solve certain forms of partial difference equations as applied to discrete systems.

3ETC02 Electronic Devices & Circuits

CO1	Comprehend the knowledge of diode and its applications in rectifier and regulator circuits.
CO2	Understand basics of BJT, JFET, MOSFET, UJT and their operational parameters.
CO3	Understand feedback concept, topologies and their applications.
CO4	Implement and analyze various electronic circuits.
CO5	Comprehend the knowledge of diode and its applications in rectifier and regulator circuits.
CO6	Understand basics of BJT, JFET, MOSFET, UJT and their operational parameters.

3ETC03 Digital System Design

CO1	Use Boolean algebra to solve logic functions, minimization techniques, number systems and its conversion, arithmetic functions.
CO2	Identify, analyze and design combinational and sequential circuits.
CO3	Understand digital logic families and their characteristics.
CO4	Use the knowledge of semiconductor memories and mapping of memories, programmable logic devices in digital design.
CO5	Use Boolean algebra to solve logic functions, minimization techniques, number systems and its conversion, arithmetic functions.
CO6	Identify, analyze and design combinational and sequential circuits.

3ETC04 Electromagnetic Waves

CO1	Understand the coordinate systems and vector integrals.
CO2	Evaluate Electric Field Intensity for different charge distributions.
CO3	Evaluate Magnetic Field Intensity due to current carrying conductors.
CO4	Understand scientifically about Maxwell's equations & Boundary conditions.
CO5	Characterize uniform plane wave & can calculate reflection and transmission coefficient of waves at media interface.
CO6	Understand principle of radiation and radiation characteristics of theoretical & practical antennas.

3ETC05 Object Oriented Programming

CO1	Justify the basic concepts of object-oriented programming such as data types, functions, classes, objects, constructors, inheritance, overloading etc.
CO2	Design, implement, test, and debug simple programs in C++.
CO3	Describe how the class mechanism supports encapsulation and information hiding.

CO4	To know the concept of operator overloading
CO5	Understand inheritance in C++
CO6	Design and test the implementation of Java programming concepts

3ETC06 Electronic Devices and Circuits - Lab

CO1	Acquiring basics of parameters and operation of various semiconductor devices.
CO2	Implementation of basic circuits using electronic devices.
CO3	Verification and analysis of performance of electronic circuits.

3ETC07 Digital System Design - Lab

CO1	Apply practically the concepts of digital electronics.
CO2	Explain the operation and characteristics of various digital logic families.
CO3	Understand the operation of various logic gates and their implementation using digital IC's.
CO4	Design and implement various combinational logic circuits.
CO5	Design and implement various sequential logic circuits.
CO6	Design and mapping of various types of memories.

3ETC08 Object Oriented Programming -Lab.

CO1	Justify the basics of object-oriented design and the concepts of encapsulation, abstraction, inheritance, and polymorphism.
CO2	Design, implement, test, and debug simple programs in an object-oriented programming language.
CO3	Describe how the class mechanism supports encapsulation and information hiding.
CO4	Design and test the implementation of C++ and java programming concepts.

Semester-IV

4ETC01 Analog and Digital Communication

CO1	Understand the necessarily of modulation and identify the various components of analog and digital communication system
CO2	Understand different modulation and demodulation schemes in Analog communication systems
CO3	Compare and contrast the strengths and weakness of various communication systems
CO4	Apply the concept of probability theory in communication system
CO5	Anayse the performance of various pulse modulation schemes
CO6	Understand the basic building blocks of digital communication systems and formatting of digital signal
CO7	Understand concept of information theory and alanyse information transmission over communication channel
CO8	Analyse the performance of different digital modulation techniques

4ETC02 Analog Circuits

CO1	Perform evaluation of the switching behavior of semiconductor devices.
CO2	Comprehend the knowledge of basic concepts and performance parameters of Op-Amp.
CO3	Use Op-Amp for implementation of linear and non-linear applications.
CO4	Comprehend the knowledge of PLL, its applications and data converters.

4ETC03 Network Theory

CO1	Describe data communication Components, Networks, Protocols and various topology based network architecture
CO2	Design and Test different encoding and modulating techniques to change digital –to- digital conversion, analog-to-digital conversion, digital to analog conversion, analog to analog conversion,
CO3	Explain the various multiplexing methods and evaluate the different error detection & correction Techniques.
CO4	Illustrate and realize the data link control and data link protocols.
CO5	Describe and demonstrate the various Local area networks and the IEEE standards.

4ETC04 Signals and Systems

CO1	Understand the continuous time signals and systems mathematically and their classification along with the mathematical operations that can be performed on them.
CO2	Understand the spectral characteristics of continuous-time periodic signals using Fourier series.
CO3	Analyze the spectral characteristics of continuous-time aperiodic signals and systems using Fourier Transform.
CO4	Apply the Laplace transform for analysis of continuous-time systems.
CO5	Understand the Discrete Time signals and systems mathematically and understand their classification along with the mathematical operations that can be performed on them.
CO6	Analyze the spectral characteristics of Discrete Time signals and systems using Discrete Time Fourier Transform.

4ETC05 Values & Ethics (HS)

CO1	By the end of the course, students are expected to become more aware of themselves, and their surroundings (family, society, nature);
CO2	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
CO3	They would have better critical ability.
CO4	They would also become sensitive to their commitment towards what they have understood (human values, human relationship, and human society).
CO5	It is hoped that they would be able to apply what they have learnt to their own self in different day-today settings in real life, at least a beginning would be made in this direction.

4ETC07 Analog Circuits Lab

CO1	Implement wave shaping circuits using passive components, diode and BJT and perform their analysis.
CO2	Demonstrate linear and non-linear applications of Op-Amp.
CO3	Implement PLL in certain applications.

4ETC08 Network Theory - Lab

CO1	To apply knowledge of Mesh and Node analysis for a given network.
CO2	To apply various network theorems to solve networks.
CO3	To apply knowledge of Two Port network and Network Functions to analyze given network.

4ETC09 Signals and Systems - Lab

CO1	After successful completion of this course, students will be able to
CO2	Generate different plots and explore results to draw valid conclusions and inferences in Signal Processing.
CO3	Enable on how to approach for requirement of signal processing and system design using simulation tools.
CO4	Familiarize with the concepts of sampling.

Semester-V

5ETC01 Microcontroller

CO1	Attain the knowledge of Microprocessor 8085.
CO2	Understand the Interfacing of various peripheral devices with Microprocessor 8085
CO3	Attain the knowledge of Microcontroller 8051
CO4	Understand assembly language & C Programming for Microcontrollers
CO5	Understand the Interfacing of various peripheral devices with Microcontroller 8051
CO6	Gain knowledge of advance Microcontroller

5ETC02 Control System

CO1	Understand mathematical models of electrical, mechanical and electromechanical systems.
CO2	Determine transfer functions from block diagrams and signal flow graph.
CO3	Evaluate transient response and steady state response parameters.
CO4	Analyze stability of the LTI system using Routh criterion and root locus
CO5	Analyze stability of the LTI system using bode plot and Nyquist criterion
CO6	Create the state model and Evaluate response of the system using state variable method

5ETC03 Digital Signal Processing

CO1	Manipulate the discretetimesignals and identify the type system.
CO2	Compute the Z-transform of a sequence, identify its region of convergence and compute the inverse Z-transform.
CO3	Evaluate the Fourier transform of a signal.
CO4	DesignFIRandIIRfilters.
CO5	Understand the concepts of Multirate Digital Signal Processing and need of Filter banks.
CO6	Understand the application of Digital Signal Processing

5ETC04 Professional Elective - I (PE-I): (i) Power Electronics

CO1	Analyze the characteristics of various power electronics devices.
CO2	Understand SCR firing circuits, commutation techniques.
CO3	Analyze and design controlled rectifiers and dual converters.
CO4	Analyze and design DC to DC, AC to AC converters and DC to AC inverters
CO5	Design and develop power electronic circuits for various applications.
CO6	Know various applications of power converters in DC drives.

5ETC04 Professional Elective - I (PE-I): (ii) Fiber Optics Communication

CO1	Understand the principles fiber-optic communication, the components and Losses and dispersion in fiber.
CO2	Understand the properties of the optical fibers and optical components in sources.
CO3	Understand operation of lasers, LEDs, and detectors in fiber.
CO4	Analyze system performance of optical communication systems in networks.
CO5	Understand the block diagram of FOC System with Power budgeting parameters.
CO6	To apply the knowledge of fiber optical components, links, and systems.

5ETC04 Professional Elective - I (PE-I): (iii) Speech and Audio Processing

CO1	Illustrate how the speech production is modeled.
CO2	Summarize the techniques involved in collecting the features from the speech signal in time and frequency domain.
CO3	Summarize the various speech coding techniques.
CO4	Understand the process Speech Synthesis. 5
CO5	Apply techniques/methods used for speech enhancement.
CO6	Apply techniques/methods used for speech recognition.

5ETC05 Open Elective - I (OE-I): (i) Sensors and Transducers

CO1	Understand the basic aspect of transducers and sensors
CO2	Gain knowledge of statistical characteristic and Errors of system.
CO3	Realize the fundamental concept about temperature and Velocity measurement
CO4	Acquire knowledge of measurement of displacement and Humidity.
CO5	Familiarize the basic information about measurement of Pressure, Flow, Level
CO6	Aware about the basics of Strain gauge and smart sensors

5ETC05 Open Elective - I (OE-I): (ii) Data Structure

CO1	Able to understand basics and applications of different linear and nonlinear data structures
CO2	Able to design and implement various data structure algorithms and analyze the efficiency of an algorithm.
CO3	Able to understand Linked List and implement algorithm.
CO4	Able to understand the working principle and Implementation of stacks and queues.
CO5	Able to implement learn Trees, Graph and their applications
CO6	Able to write an algorithm on different sorting methods and analyze the complexities of

	algorithms

5ETC05 Open Elective - I (OE-I): (iii) Introduction to Java

CO1	Fundamentals of Object Oriented Programming and can build & run a basic application at their own
CO2	Use of selection & repetition statements in Java Program, dealing with methods and playing with classes and objects in real world
CO3	To create and process single dimensional & multidimensional arrays, to handle strings in Java
CO4	To create interactive graphical user interface in a desktop application using AWT and/or SWING Components.
CO5	To handle exceptions and create user defined exception, also learns file handling in Java.
CO6	To learn concept of multithreading; create, manage threads; and purpose of synchronization

5ETC09 Electronic Lab Based on Instrumentation

CO1	Learn about various Sensors
CO2	Examine the measurement of various physical quantities using transducers
CO3	Aware of statistical data analysis of different transducers
CO4	Understand computerized data acquisition

Semester-VI

6ETC01 Communication Network

CO1	Identify different types of network devices and their functions within a network.
CO2	Understand the basic functions of data logical link control and media access control and protocol used in these layers.
CO3	Distinguish between the layers of the OSI and TCP/IP model
CO4	Analyze, specify and design routing strategies for an IP based networking infrastructure
CO5	Understand the concept of reliable and unreliable transfer protocol of data and how TCP and UDP implement these concepts.
CO6	Understand various Application layer Protocols.

6ETC02 Computer Architecture

CO1	Learn how computers work
CO2	Analyze the performance of computers
CO3	Perform floating point arithmetic operations and design ALU as per the requirement
CO4	Know how computers are designed & built
CO5	Understand and design different types of memory systems
CO6	Understand issues affecting recent processors

6ETC03 Professional Elective - II (PE-II): (I) Cmos Design

CO1	To understand the concept of CMOS circuit.
CO2	To draw Layout, Stick diagrams of CMOS Circuits.
CO3	To analyses the CMOS circuit performance parameter
CO4	To implement combinational CMOS circuit design using CMOS logic families.
CO5	To design sequential CMOS circuit.
CO6	To design the CMOS circuit using dynamic CMOS logic

6ETC03 Professional Elective - II (PE-II): (II) Satellite Communication

CO1	Visualizethearchitectureof satellitesystems as ameans of high speed,high range communication system.
CO2	Statevariousaspectsrelatedtosatellitesystemssuchas orbitalequations, sub-systems in a satellite
CO3	Solvenumerical problemsrelatedtoorbitalmotionanddesignoflinkbudgetforthe given parametersandconditions.
CO4	Learnadvancedtechniquesandregulatoryaspectsofsatellitecommunication
CO5	Understand role of satellite in various applications
CO6	Understand VSAT and GPS

6ETC03 Professional Elective - II (PE-II): (III) Adaptive Signal Processing

CO1	Comprehend adaptive system and functions.
CO2	Evaluate the performance of various methods for designing adaptive filters through estimation of different parameters.
CO3	Understand the concepts of gradient and mean square error performance in adaptive systems
CO4	Analyze convergence and stability issues associated with adaptive filter design and come up with optimum solutions.
CO5	Apply an adaptive filter algorithm that recursively finds the coefficients that minimize a weighted linear least squares cost function.
CO6	Implement applications of adaptive signal processing

6ETC04 Open Elective - II (OE-II): (i) Introduction to Python Programming

CO1	Interpret the fundamental Python syntax and semantics
CO2	Be fluent in the use of Python control flow statements
CO3	Perform basic CURD operations on Mongo DB using Python.
CO4	Determine the methods to create and manipulate Python programs by utilizing the data structures like lists, tuples and sets.
CO5	Identify the commonly used operations involving file systems and regular expressions.
CO6	Identify the commonly used operations involving file systems and regular expressions.
	To learn and use operators

6ETC04 Open Elective - II (OE-II): (ii) Database Management System

CO1	Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
CO2	Define the terminology, features, classifications, and characteristics embodied in database systems
CO3	Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
CO4	Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
CO5	Understand the basic issues of transaction processing
CO6	Understanding the basic issues of concurrency control and dead lock in database.

6ETC04 Open Elective - II (OE-II): (iii) Renewable Energy Sources (Solar & Electric Vehicles)

CO1	Understand the concept of Solar cell and estimate solar energy availability.
CO2	Learn Solar cell Technologies
CO3	Understand the concept of Power Electronic Converters
CO4	Learn about Hybrid Electric Vehicles
CO5	Learn Electric drives
CO6	Learn about electric storage

6ETC05 Engineering Economics

CO1	Learn basics of Engineering Economics
CO2	Understand and compute the production cost
CO3	Study different cash flow methods
CO4	To evaluate Engineering alternatives
CO5	Understand depreciation analysis
CO6	Understand Indian Banking System

6ETC09 Mini Project

CO1	Identify problems based on societal /research needs.
CO2	Apply Knowledge and skill to solve societal problems in a group.
CO3	Develop interpersonal skills to work as member of a group or leader.
CO4	Analyze the impact of solutions in societal and environmental context for sustainable development.
CO5	Excel in written and oral communication.
CO6	Demonstrate project management principles during project work.

Semester-VII

7ETC01 Microwave Theory and Techniques

CO1	Understand operations of microwave active and passive devices
CO2	Understand operations of Semiconductor Microwave Devices.
CO3	Describe characteristics of microwave propagation through waveguide and parallel micro strip line
CO4	Understand Operations of Microwave resonators.
CO5	Use S-parameters for characterization of microwave devices.
CO6	Measure various parameters of microwave system

7ETC02 Digital Image and Video Processing

CO1	Understand basic concept of Project management
CO2	Attain the knowledge of cost estimation & working capital
CO3	Prepare Cost Sheets, balance sheets and Cash Flow statements
CO4	Understand the Entrepreneurial competencies & traits
CO5	Discuss the Management skills for Entrepreneurs
CO6	Understand Social Entrepreneurship

7ETC03 Project Management & Entrepreneurship

CO1	Manipulate the discrete time signals and identify the type system.
CO2	Compute the Z-transform of a sequence, identify its region of convergence and compute the inverse Z-transform.
CO3	Evaluate the Fourier transform of a signal.
CO4	Design FIR and IIR filters.
CO5	Understand the concepts of Multirate Digital Signal Processing and need of Filter banks.
CO6	Understand the application of Digital Signal Processing

7ETC04 Professional Elective - III (PE-III)(i) (i) High Speed Electronics

CO1	Explain significance and the areas of application of high-speed electronics circuits
CO2	Analyze effect of noise in high speed application
CO3	Summarize the properties of various components used in high speed electronics
CO4	Design the various type of RF amplifier for high speed application
CO5	Explain the operation of the Mixer, Oscillator and PLL transceiver
CO6	Design the various types of PCB using CAD tool

7ETC04 Professional Elective - III (PE-III)(ii) Mobile Communication and Networks

CO1	Explain basic concept of Cellular systems and standards
CO2	Demonstrate knowledge of Signal propagation model
CO3	Compare different multiple access techniques in mobile communication.
CO4	Summaries the concept of rake receiver
CO5	Demonstrate advance knowledge of MIMO
CO6	Compare different Mobile Communication Systems and standards

7ETC04 Professional Elective - III (PE-III) (iii) Mixed Signal Design

CO1	Expand knowledge of the CMOS Process, and op-amp design
CO2	Devise appropriate switch capacitor circuits
CO3	Analyze phase lock loop circuits
CO4	Use desired data converters in various applications.
CO5	Explain Various types of A/D Converters
CO6	Understand D/A converters.

7ETC05 Professional Elective - IV (PE-IV) (i) Introduction to MEMS

CO1	Demonstrate skills to select appropriate material for MEMS devices
CO2	Understand fabrication process of MEMS
CO3	Select appropriate sensor and actuator in a given application

7ETC05 Professional Elective - IV (PE-IV) (ii) Error Correcting Codes

CO1	Understand the error sources
CO2	Understand error control coding applied in digital communication
CO3	Able to transmit and store reliable data and detect errors in data through coding
CO4	Able to understand the designing of various codes like block codes, cyclic codes, convolution codes, turbo codes and space codes

7ETC05 Professional Elective - IV (PE-IV) (iii) Antenna and Propagation

CO1	Describe the basic concepts and applications of Antenna systems.
CO2	Determine the radiation pattern and directivity of antenna arrays.
CO3	Describe the concept of Huygens Principle & Babinet's Principle.
CO4	Understated the properties of broadband antennas and micro strip antennas.
CO5	Describe the basic principles of smart antenna systems.
CO6	Understand different ways of propagation of radio waves.

Semester-VII

8ETC01 Embedded Systems

CO1	Recognize the concept of Embedded Systems
CO2	Summarize the quality attributes of Embedded System
CO3	Articulate the architecture and inbuilt peripherals of AVR Microcontroller
CO4	Evaluate the programming of AVR Microcontroller in C
CO5	Compare task, process & threads in Real Time Embedded System
CO6	Assess validation and debugging of Embedded System

8ETC02 Cryptography and Network Security

CO1	Understand basic cryptographic algorithms
CO2	Attain the knowledge of message and web authentication and security issues.
CO3	Identify information system requirements
CO4	Understand the current legal issues towards information security
CO5	Discuss the fundamental ideas of public-key cryptography
CO6	Understand Intrusions and intrusion detection

8ETC03 Professional Elective V (PE-V) (i) Nano Electronics

CO1	Understand various aspects of nano-technology and the processes involved in making nano components and material.
CO2	Leverage advantages of the nano-materials and appropriate use in solving practical problems.
CO3	Understand various aspects of nano-technology and the processes involved in making nano components and material.
CO4	Leverage advantages of the nano-materials and appropriate use in solving practical problems.
CO5	Students will understand the divers electronic device fabrication.
CO6	Students will have in-depth technical knowledge in one or more areas of specialization.

8ETC03 Professional Elective V (PE-V) (ii) Wireless Sensor Networks

CO1	Understand the basis of Sensors with its applications
CO2	To learn the architecture and placement strategies of Sensors
CO3	To analyze routing and congestion algorithms
CO4	To design, develop , and carry out performance analysis of sensors on specific applications
CO5	To explore and implement solutions to real world problems using sensor devices, enumerating its principles of working
CO6	To understand the working through the case study on WSN.

8ETC03 Professional Elective V (PE-V) (iii) Wavelets

CO1	Introduce with basic concepts of Wavelets.
CO2	Understand the wavelet transform for continuous and discrete time signals
CO3	Study the basic concepts of multi resolution analysis.
CO4	Study filter bank algorithm in details.
CO5	Study the application of wavelet transform for data compression.
CO6	Learn the application of Wavelet transform in different fields.

8ETC03 Professional Elective V (PE-V) (iv) Bio-medical Electronics

CO1	Understand fundamentals of Medical Instrumentation, Biomedical Signals and Electrode.
CO2	Identify and classify various Biomedical Transducers.
CO3	Illustrate the significance of human signals and recording techniques
CO4	Familiarize with Modern medical imaging systems.
CO5	Conceptualize requirements and importance of Patient Care and Monitoring and Safety.
CO6	Describe the function and necessity of Physiological and electrotherapy equipments.

8ETC04 Professional Elective VI (PE-VI) (i) 5G-6G Mobile Communication

CO1	Illustrate the evolution of mobile communication leading to the introduction of 5G.
CO2	Explain the key innovations in radio and network.
CO3	Elaborate the standardization process and timeline for 5G
CO4	Identify the spectrum requirements.
CO5	Discuss key issues and challenges in 5G deployment.
CO6	Understand the concept of 6G

8ETC04 Professional Elective VI (PE-VI) (ii) Information Theory and Coding

CO1	Understand the concept of information and entropy
CO2	Understand Shannon's theorem for coding
CO3	Calculation of channel capacity
CO4	Discuss the various capacity reduction based coding techniques for text, audio and speech type of data
CO5	Compare various capacity reduction based coding techniques for image and video type of data.
CO6	Implement various error control techniques for Convolutional codes

8ETC04 Professional Elective VI (PE-VI) (iii) Scientific Computing

CO1	View scientific computing as the point of intersection between computer science, numerical mathematics, and modeling.
CO2	Introduce to numerical mathematics and prepares them for the scientific computing part.
CO3	Learn to solve Nonlinear equations useful for computer models
CO4	Learn to solve Numerical differentiation useful for computer models
CO5	Learn to use MATLAB.
CO6	Learn to use python for the applications in scientific computing

8ETC07 Project Stage-II

CO1	Demonstrate a sound technical knowledge of their selected project topic..
CO2	Undertake problem identification, formulation and solution.
CO3	Design engineering solutions to complex problems utilising a systems approach.
CO4	Conduct an engineering project.
CO5	Communicate with engineers and the community at large in written an oral forms.
CO6	Demonstrate the knowledge, skills and attitudes of a professional engineer.

PSOs and COs of the Mechanical Engineering Deptt.

Program Specific Outcomes (PSOs)

PSO1	The Mechanical Engineering graduate will have the ability to understand, analyze and try to prepare the solution for complex problems regarding mechanical engineering design.

PSO2	The Mechanical Engineering graduate will have the ability to understand, analyze and try to prepare the solution for complex problems regarding thermal engineering.
PSO3	The Mechanical Engineering graduate will have the ability to understand, analyze and try to prepare the solution for complex problems regarding manufacturing processes of various components.
PSO4	The mechanical engineering graduate will be able to develop/ model the complex engineering solutions
PSO5	The Mechanical Engineering graduate will have the ability to understand the recent techniques, advance software, like CATIA, ANSYS, Fluent, etc.

Course Outcome (Cos)

Semester-III

3ME01 Engineering Mathematics-III

CO1	Understand ordinary differential equation
CO2	Learn about Laplace transformation and its applications
CO3	Understand PDEs of 'n'th order with constant coefficients
CO4	Learn about Numerical Methods
CO5	Understand the concept of Complex variables
CO6	Understand the concept of Statistics

3ME02 Mechanics of Materials

CO1	To emphasize on the mechanical properties of materials. Mainly stress-strain diagram, uniaxial and biaxial tensions and compressions
CO2	To make the students understand about the beams and their loading effects like axial force and shear force, shear force and axial load diagram.
CO3	Provide knowledge about stresses in beams mainly in shear and bending, strain energy and its effects.
CO4	To explain in details about the phenomenon of torsion in thick and thin cylinders, solid and similar such geometries.
CO5	To study the effects of combined, bending and principal stresses

3ME03 Fluid Power-I

CO1	To make the students aware about the concepts of fluid mechanics including the concept of mass and momentum conversion.
CO2	To make the students able to understand and apply the Bernoulli's equation to solve the problems in fluid mechanics
CO3	To apply the Control-Volume analysis to the problems in fluid mechanics
CO4	To apply the Darcy-Weisbach equation to solve the problems in pipe flow
CO5	To develop the ability to perform dimensional analysis for complexities in Fluid Mech.
CO6	To grasp the concept of Laminar, Turbulent and Boundary Layer fundamentals.
CO7	To make the students able to understand and apply the concept of Viscosity which is important in real fluid flow

3ME04 Engineering Thermodynamics

CO1	Students will understand the fundamental concepts of Thermodynamics
CO2	Students will be able to solve theoretical problem of heat and work.
CO3	Students will understand First Law of Thermodynamics and its application in engineering devices
CO4	Students will understand Second Law of Thermodynamics and its application in engineering devices
CO5	Students will understand importance of Entropy and its effect on different processes.
CO6	Students will study different power cycles and learn to derive work and efficiency.

3ME05 Manufacturing Process-I

CO1	Students will understand the basic casting process and its elements like patter, sand etc.
CO2	Students will understand functioning of furnaces and its types. Also they will be able to inspect defects in castings.
CO3	Students will understand different types of casting processes.
CO4	Students will understand cold and hot working processes and its applications in production engg
CO5	Use the knowledge of different joining processes in production.

CO6	Understand conventional and non-conventional joining processes. Also they will be introduced to surface treatments.

Semester-IV

4ME01 Basic Electrical Driver & Control

CO1	Understand concept of general electric drive and its applications.
CO2	Understand the technical characteristics of motors and their construction
CO3	Understand different kinds of 3 Phase motors, their working and applications.
CO4	Understand different kind of voltage control devices
CO5	Understand different kinds of sensors, switches, contacts and their basic applications
CO6	Understand different kinds of sensors, switches, contacts and their basic applications
CO7	Learn industrial application of industrial drives

4ME02 Engineering Metallurgy

CO1	Classify materials on the basis of structures and alloys along with their applications
CO2	Construct Fe-C equilibrium, diagram along with important properties.
CO3	Acquire knowledge about composite materials, their application and advantages
CO4	Utilize non ferrous metals and its alloys theoretically such as Al, Zn, Pb
CO5	Study the heat treatment processes for improving the metal properties for materials. This would involve study of Annealing, Normalizing, Tempering etc
CO6	Study the mechanical working of metals such as Carburizing, Nitriding, Cyaniding, hot and cold working of metals etc.
CO7	Grasp the concept of Powder metallurgy and study the methods of manufacturing metal powders

4ME03 Energy Conversion-I

CO1	Learn the various properties of steam and utilization of steam as a working fluid
CO2	Acquire basic knowledge of various boilers, its mountings and accessories and about the parameters governing the performance of boilers
CO3	Get the knowledge of fuel and ash handling systems.
CO4	Know about the basic layout of steam power plant and its site selection.
CO5	Analyze the steam turbines and know about the concept of governing

4ME04 Manufacturing Process-II

CO1	Study in details about all the parameters related to tool such as tool life, tool wear, cutting forces etc.
CO2	Study the details of construction, working and operation of Centre Lathe, Capstone and Turret Lathe
CO3	Study the details of construction, working and operation of Drilling, Boring and Broaching
CO4	Study the details of construction, working and operation of Milling
CO5	Study Unconventional machining processes including Mechanical, Thermal and Electrochemical machining
CO6	Study finishing and super finishing processes like

4ME05 Machine Design & Drawing-I

CO1	Solve for the view which aren't visible/solved with the help of sectional view
CO2	Understand the principles of development of tin smithy and sheet metal work. Development of surfaces and intersection of solids.
CO3	Study the types of stresses like Thermal, Torsional stresses in straight and curved beam. Frequently used in industrial applications such as hooks, C-clamp
CO4	Study the construction, working and principles of riveted joints and welded joints
CO5	Classify springs and understand their industrial applications
CO6	Design power screw

Semester-V

5ME01 Production Technology

CO1	Understand the concept of TQM
CO2	Understand the quality charts such as ND-curve, control charts

CO3	Understand the principles of work study
CO4	Understand the standards of measurements
CO5	Understand linear measurement devices like comparators and angular measurements, screw thread measurements
CO6	Understand Gear measurement devices and errors in gear measurements like runout and backlash

5ME02 Heat Transfer

CO1	differentiate between thermodynamics and heat transfer
CO2	acquire knowledge about various heat transfer processes
CO3	apply the governing equations of conduction for various geometries
CO4	be able to calculate the size of insulation for geometries undergoing heat transfer
CO5	understand the phenomenon of convection and be able to solve problems of convection
CO6	understand the effect of radiation and its significance in daily life
CO7	Design and develop heat exchangers using methodologies like LMTD, NTU

5ME03 Measurement System

CO1	Study the types, configurations and functional elements of measuring instruments
CO2	Find different types of characteristics and errors in measuring instruments
CO3	Study devices used for strain and pressure measurement with special reference to industrial applications
CO4	Study the methodologies, construction and detail working of Force, Power, Flow and Torque measurement
CO5	Study the methodologies, construction and detail working of Temperature and Liquid level measurements
CO6	Study the methodologies, construction and detail working of Speed, Vibration, Displacement measurements

5ME04 Theory of Machine –I

CO1	Get introduced to mechanisms, its types and inversions
CO2	Kinematically analyze the mechanisms
CO3	Perform velocity and acceleration analysis of simple and compound mechanisms with different methods such as instantaneous centre method etc
CO4	Study the types of synthesis of mechanisms with graphical methods, overlay method etc
CO5	Study the working, construction and details of instruments utilizing friction such a s bearings, clutches, brakes.
CO6	Study the profile and utilization of cams, followers by Graphical methods
CO7	Define the terminologies used in gears along with their profile

5FEME05 Free Elective-I/ PROJECT MGT

CO1	Understand the meaning and concept of projects, managements, constraints of projects
CO2	Understand the concept of project organization and planning
CO3	Learn the budgeting and cost estimation of projects
CO4	Learn the scheduling and resource allocations such as CPM, PERT etc
CO5	Understand the project controls, monitoring, project cost over runs and cost controls
CO6	Understand issues in management of projects, concepts, techniques, cost escalation and study of the feasibility of project

Semester-VI

6ME01 Fluid Power-II

CO1	Get the basic knowledge of hydraulic prime movers like impulse and reaction turbine. Also they should gather knowledge about their characteristics and governing equations.
CO2	Select and use appropriate pumps as per given applications. They will be able to interpret the characteristics of a pump.
CO3	Understand the working and difference between axial flow pumps . Get acquired about the knowledge of CFD.
CO4	Deal with the working and analysis of positive displacement pumps.

CO5	Know about compressible fluid flow.
CO6	Get acquainted with hydrostatic and hydrokinetic system

6ME02 Computer Software Applications

CO1	Understand the concept of DBMS
CO2	Understand the structure of relational databases along with algebra operations
CO3	Understand the concept of Database design and entity relational model
CO4	Understand the SQL
CO5	Understand relational database design along with atomic domains and modeling temporal data
CO6	Understand the concept of modeling and simultaion

6ME03 Control System Engineering

CO1	Understand the transfer function of feed back system
CO2	Conceptualize industrial controllers, their types, construction and working
CO3	Learn time domain analysis
CO4	Conceptulaize stability using Root locus and Bode plots
CO5	Understand the concept of Gain margin and Phase margin
CO6	Study the importance of automatic speed control systems like prime movers, generators etc

6ME04 Theory of Machine –II

CO1	Study static force anlysis to plane motion mechanisms
CO2	Learn about hydrodynamic lubrication, thin and thick film lubrication system
CO3	To find the output of machineries using Crank Effort and Turning moment diagram
CO4	Study the effect of inertia forces in various parts of reciprocating engine by graphical method
CO5	Conceptual Vehicle Dynamics
CO6	Study and realize the importance of mechanical vibrations and also find their frequency
CO7	Study multi rotor vibration systems and learn about static and balancing of masses

6FEME05 Free Elective-II/NES

CO1	Familiarize themselves with varoius Non Conventional Sources of energy and way of harnessing them
CO2	Conceptualize the use of solar radiations as a source of energy
CO3	Study the instruments used for measuring radiations
CO4	Learn about the methodologies used for collecting the solar energy
CO5	Learn about techniques and methods for solar energy utilization and storage
CO6	Conceptualize the availability and harnessing ways for energy available in Oceans
CO7	Provide solutions related to various environmental issues associated with the use of conventional fuels
CO8	Learn about the energy resources such as Biomass, Solar energy plantation
CO9	Study direct energy conversion technologies
CO10	Focus upon the use of vegetable oil as liquid fuels

6ME06 Communication Skills

CO1	Study newer lexicons and comprehension ways
CO2	Communicate more effectively
CO3	Create stage daring and open environment for communication
CO4	Explore newer and more effective styles of communication
CO5	Develop writing skills
CO6	Effective communicate in teams and groups
CO7	Know about correct ways of conducting meetings, conferences, symposiums etc

Semester-VII

7ME01 Machine Design & Drawing-II

CO1	To make the students aware about types of power transmission devices and their design such as for shafts, keys and couplings in details.
CO2	To make students able to calculate amount of heat generated in various types of bearings, energy stored in flywheels and applications of wire rope in industries

CO3	To be able to calculate various stresses in IC Engine parts
CO4	To introduce the concept of Governor and find the mass and centrifugal forces of fly balls
CO5	To be able to find the bending, tensile stresses in gears
CO6	To determine the torsional rigidity, strength, stiffness, specific weight of the shaft

7ME02 Energy Conversion –II

CO1	To understand to study P-V & T-S diagram of compressor & we able to solve design based problem of reciprocating Compressor
CO2	To understand to study P-V & T-S diagram of compressor & we able to solve design based problem of Rotary Compressor
CO3	To understand basic Refrigeration & Air -conditioning and solve numerical
CO4	To Understand Construction & operation of Gas turbine will able to solve numerical on gas turbine
CO5	Understand basic working of Nuclear Power plant theoretically.
CO6	Non conventional energy system and its application in engg.& society.

7ME03 Industrial Management and Costing

CO1	Understand the Functions of management, organization structure & relationship
CO2	understand the Marketing & sales Management
CO3	student will able to identify responsibility and task of different organizational function such as Marketing, Product development etc.
CO4	explain the main managerial concepts & tools used within in different organizational functions
CO5	learn to interpret financial statements and analyze how managerial decision impacts financial outcomes
CO6	understand human behavior in multi-culture environments

7ME04 Automation Engineering

CO1	Know about automation and its types
CO2	Develop codes for NC/CNC working of machine
CO3	Understand the importance of robots in manufacturing
CO4	Understand importance of Group technology
CO5	Learn about flexible manufacturing techniques
CO6	Grasp the importance and know about the methods of using computer for manufacturing purposes

7ME05 Elective – I Tool Engineering

CO1	Develop knowledge about cutting tools, their geometries, machinabilty
CO2	Learn about various metal cutting processes
CO3	Awareness regarding press tool dies
CO4	Know about various types of press tools
CO5	Design Jigs and Fixtures
CO6	Aware about cutting fluids, tool materials,, tool signature

Semester-VIII

8ME01 Elective –II/ Automobile Engineering

CO1	Classify automobiles on the basis of chassis, power unit etc
CO2	Learn about fuel feeding systems
CO3	Learn about the electrical connections in an automobile including ignition system
CO4	Learn about various possibilities for transmitting power from the engine
CO5	Learn about the braking systems in automobiles
CO6	Learn about the steering systems in automobiles
CO7	Learn about the lubrication systems in automobiles
CO8	Learn about the suspension systems in automobiles

8ME02 Elective –III Refrigeration & Air Conditioning

CO1	know about the basic refrigeration cycles with special impetus on Vapor Compression Refrigeration Cycles
CO2	Use and solve problems with the help of p-h, T-s, p-v charts for specific refrigerants

CO3	Apply the basic principles of psychrometry and applied psychrometry
CO4	Get familiarized with different refrigerants and be able to classify them as per the applications
CO5	Perform load calculations and design ducts at elementary level for air conditioning purposes
CO6	Understand and know about the various components of VCR, VAR systems

8ME03 Internal Combustion Engines

CO1	Identify the engine types and its components
CO2	Develop detail understanding of engine functions and performance
CO3	Apply the principles of Thermodynamics, Fluid Mechanics and Heat Transfer for analyzing IC Engines
CO4	Develop awareness of environmental and social issues due to usage of IC Engines for various purposes
CO5	Perform different test on Petrol and Diesel engine and verify the characteristics
CO6	Make use of modern tools for engine management

8ME04 Operations Research Techniques

CO1	Apply mathematical models that are needed to solve optimization problems.
CO2	Solve practical problem of LPP
CO3	Understand CPM & PERT. Also apply to apply it in engineering for complex problem analysis
CO4	Understand waiting line models and apply it.
CO5	Apply simulation for problem solving in engineering
CO6	Apply Dynamic programming for solving budgeting issues.

PSOs and COs of the Chemical Engineering Deptt.

Program Specific Outcomes (PSOs)

PSO1	To impart quality education in basic Science those support Chemical Engineering and
PSO2	To teach the students fundamentals in element of Chemical Engg. So as to identify, formulate and solve Chemical Engg. Process design problems.
PSO3	To acquire modern experimental techniques, concepts and tools in Chemical Engg and inculcate them in the students. To train students to apply software and computational skills to formulate and solve problems related process development and economics.
PSO4	To train the students to use latest information from journals, websites, new books for development of their presentation skills.
PSO5	To encourage the students to understand importance of lifelong learning, professionalism and social responsibilities.

Course Outcome (Cos)

Semester-III

3CH01 Applied Mathematics

CO1	To study Ordinary differential equation
CO2	To study Laplace transforms:.
CO3	To study Probability & Probability Distribution
CO4	To study Complex Analysis with Milne's method, singular points, expansion of function in Taylor's and Laurent's series, Cauchy's integral theorem and formula, Residue theorem.
CO5	To study Numerical Analysis by Solution of first order ordinary differential equations by modified Euler's, method Runge - Kutta method
CO6	To study Vector Calculus

3CH02 Process Instrumentation

CO1	Knowledge of field instrumentations
CO2	Dynamic modeling and system behavior study
CO3	Design of controllers
CO4	Application of control systems in processes

3CH03 Strength of Materials

CO1	The learning outcomes are mechanical properties, stress strain relationship and characteristics of metals
CO2	To Elaborate behavior of shear force and bending moment under variable loads
CO3	Understand concept of tension and shear stress distribution on various section of beams
CO4	Known the properties and concept of thick and thin shells subjected to pressure.
CO5	Different concept of strain energy under various loads
CO6	Behavior of various types of beams under deflection

3CH04 Chemical Engg. Thermodynamics –I

CO1	Ability to apply fundamental concepts of thermodynamics to engineering applications
CO2	Ability to estimate thermodynamic properties of substances in gas and liquid states.
CO3	Capability to determine thermodynamic efficiency of various energy related processes.

3CH05Process Calculation

CO1	Ability to make material balances on unit operations and processes
CO2	Ability to perform simultaneous material and energy balances
CO3	Understanding of the degrees of freedom analysis and its significance
CO4	Understanding of the concept of humidity and usage of psychrometric chart.

Semester-IV

4CH01 Fluid Flow Operation

CO1	Properties of fluids and their classification
CO2	Kinematics of flow, Description of velocity field, Stream functions, Angular velocity, Fluids in circulation, Irrational flow. Dimensional analysis; Buckingham'sÐ.theorem ; Dimensionless numbers and their physical significance
CO3	Fluid flow: Laminar and turbulent flows; Pressure drop in pipes and tubes, pipe fittings and pipe network and friction factor, Mechanical energy balance and Bernoulli's Theorem.
CO4	Flow measuring devices for chemical plants: Orifice meter, nozzle and venturi meters, rotameter and pitot tube.
CO5	Flow past immersed bodies, flow through packed bed fluidized bed, Introductory concepts of two-phase flow.
CO6	Pumping and compressing of chemical and gases Mixing and agitation of fluids. Compressible fluid flow and aerodynamics.

4CH 02 Chemical Engineering Thermodynamics-II

CO1	First law of thermodynamics, equation of state, critical properties, Vander Wall's constants, Thermodynamics relations based on second law. Relation between Cp and Cv, compressibility factor and coefficient of thermal expansion,
CO2	Partial molar and apparent molar properties, Gibbs Duhem equation, chemical potential, effect of temperature and pressure fugacity
CO3	Colligative properties, Ebulliometric constant. Determination of molecular weight of unknown chemical substances. Solubility law, Raoult's law and Henry's law, Deviations from Raoult's law. Comparison of ideal and nonideal systems.
CO4	Phase equilibria in non reacting multi-components, binary and ternary systems, Statistical thermodynamics, thermodynamics probability, its relation with entropy, partition function and its relation with thermodynamic functions,
CO5	Statistical thermodynamics, thermodynamics probability, its relation with entropy, partition function and its relation with thermodynamic functions, Thermodynamics charts and their uses
CO6	Chemical equilibrium, feasibility of chemical reaction, free energy change, Heterogeneous equilibria, various methods of calculating free enegy charge, equilibrium conversions, case study of feasibility report for manufacture of industrial chemicals.

4CH03 Machine design and Drawing

CO1	To study the general consideration for machine design
CO2	To study Mechanical properties of Metals
CO3	To study the Types of weldings

CO4	To study the Drives
CO5	To study the Gear drives
CO6	To study the thick and thin cylinder at high pressure.

4CH 04 Applied Physical Chemistry

CO1	Electrochemistry Ion transport in electrolytes, Electrical phenomenon at interface, Applications of electrochemistry, Electrometric titration.
CO2	Kinetic theory of gases, Postulates of kinetic theory, derivation of equation of state, Van-der-waal's equation, critical phenomenon, calculation of critical constants from Van-der-waal's equation, MaxwelBoltzmann's law of distribution of molecular speed
CO3	Radiation chemistry and spectroscopy, Radiation chemistry, Spectroscopy.
CO4	Surface phenomenon and Catalysis, Catalysis with Concepts of acid- base catalysis, Contact theory of Heterogeneous catalysis.
CO5	Chemical Equilibrium and kinetics and molecular reaction dynamics.
CO6	Thermodynamics, Origin of First law, thermodynamic terms and their definitions, Heat ,Energy and work function Second law, Third law of Thermodynamic.

4CH05 Mechanical operation

CO1	To study the versus types Size reduction, laws of energies, energy requirements.
CO2	to see Type of Equal falling particles, equipment, Gravity settling, Sedimentation.
CO3	to observe Storage and handling of solids, transportation.
CO4	To study the Filtration operation and Filter calculations.
CO5	To study Centrifuges, types and calculations, Cyclones.
CO6	To study Adsorption, type and application, Langmuir's FreundLich;s equation,

Semester-V

5CH01 Heat Transfer

CO1	Basic modes of heat transfer
CO2	Convection and radiation at industrial level and domestic plane
CO3	Applications of heat transfer in daily life
CO4	Design concepts of various heat exchanger used in industry
CO5	Evaporation significance
CO6	Boiling and Condensation

5CH01 Heat Transfer

CO1	Basic modes of heat transfer
CO2	Convection and radiation at industrial level and domestic plane
CO3	Applications of heat transfer in daily life
CO4	Design concepts of various heat exchanger used in industry
CO5	Evaporation significance
CO6	Boiling and Condensation

5CH02 Inorganic Chemical Technology (CEP-I)

CO1	Introduction to Unit Operations and Chemical Engineering Processes and Overview of Indian chemical industry, raw material and energy sources, role of catalysis, inorganic products, organic intermediates and final products.
CO2	Pulp and Paper Industries: Types, raw materials, manufacture of pulp and paper also In detail about cement Industry and lime industry
CO3	To study Organic chemicals based on methanol and ethanol (e.g., formaldehyde, acetaldehyde, acetic acid)
CO4	Concept of Industrial processes for ammonia, syngas and hydrogen, methanol, chemicals from oxo-synthesis and Acids: Sulfuric acid, nitric acid, hydrochloric acid and Fertilizer Industry
CO5	In detail of Principles of electro-chemical technological process; Electrolytic process in igneous and molten system; caustic soda, chlorine
CO6	Detail concept of Electro-thermal Industries: aluminum, lithium, titanium. Electro-chemical sources of energy and storage.

5CH03 Economics & Management

CO1	To study the types of Mangement
CO2	To study the different types of market
CO3	Introduction about globalization and taxes
CO4	To study the function and scope of personal management
CO5	To study the advertisement and market research
CO6	To study the function of financial management and material management.

5CH 04 Material science & Engineering

CO1	Stress and strain developed in various engg materials
CO2	Inspecting various physical properties of engg materials
CO3	To study metals and their important properties
CO4	Corrosion and its control
CO5	importance of polymers in industry
CO6	Importance of ceramics and glasses in industry.

5CH 05 Project management

CO1	Concepts of Project & Project Selection : Project & development, concept of a project, Types of project selection models, Analysis under high uncertainty, project proposals.
CO2	Project organization and planning: organizational form, strategic variables, need for planning with project coordination
CO3	Budgeting and Cost Estimation: estimating project budgets, improving the process of cost estimation, Life-cycle-costing, project cost reduction methods.
CO4	Scheduling and resource allocation ; Network Techniques CPM and PERT, Gantt Charts, resource constraints, resource loading, resource leveling,
CO5	Project Control: monitoring and information systems MIS, purposes of control, types of control processes, project cost overruns and cost control, project audit.
CO6	Issues in project Management: Multicultural, issues, project cost escalation, conflict zones in project management,

5CH06 Communication Skill

CO1	Demonstrate critical and innovative thinking, Display competence in oral, written, and visual communication.
CO2	Apply communication theories, Show an understanding of opportunities in the field of communication.
CO3	Use current technology related to the communication field, Respond effectively to cultural communication differences, Communicate ethically,Demonstrate positive group communication exchanges.

Semester-VI

6CH01 Chemical Engineering Operation (Mass Transfer-I)

CO1	Students will learn about the diffusion mass transfer
CO2	Operation of cooling tower will be clearly understood
CO3	Operation of Dryer will be understood
CO4	Student will understand the mechanism of crystallization and absorption
CO5	Principles of crystallization process of crystallizations and terminology membrane separation principle concept and application.
CO6	Different thermodynamics cycle such as vapor compression cycle, refrigeration cycle, Rankin power cycle.

6 CH 02 Organic Chemical Technology (Chemical Engineering Process –II)

CO1	Fermentation Industries: Industrial alcohol, absolute alcohol, wine, Organic acid production: Acetic acid, lactic acid, citric acid.
CO2	Polymerization Industries: Polyethylene, polypropylene, PVC, polyester synthetic fibers, Rubber Industries: Natural rubber, synthetic rubber, SBR.
CO3	Petroleum Refinery: Refining of crude oil, products of refining, Petrochemicals: Significant

	petrochemicals and their derivatives.
CO4	Nitration: Nitration agents, kinetics, mechanism, industrial preparation of nitrobenzene, nitronaphthalene, chloronitronaphthalene, nitroacetanilide, Sulphonation and Sulfation: agents, kinetics, mechanism, technical preparation of aliphatic sulphonates, sulphonation of lauryl alcohol, dimethyl ether
CO5	Hydrogenation and hydrolysis
CO6	Halogenation: Technical preparation of halogen compounds- allyal chloride, DDT, BHC, chlorobenzene, vinyl chloride, Oxidation: Liquid and vapour phase oxidation, technical oxidation of isopropyl benzene, naphthalene, benzene, ethyl benzene, naphthalene sulfonic acid

6CH03 Computer Programming & Application

CO1	Numerical solution of first order differential equations with initial condition, Euler's method,Runge-Kutta method.
CO2	stems of linear equations, solution by the method of determinants, matrix inversion for the solution of linear equations, Gauss elimination method, Roots of algebraic and transcendental equation, iteration methods, Regula-Falsi method, Newton-Raphson method.
CO3	Regression analysis - Least Square, error approach, approximation by Chebychev orthogonal polynomial
CO4	Elements of optimization techniques, single variable function, optimization-direct search,
CO5	Computer programming in modular form, use of subroutine libraries, Block diagrams of preliminary aids in programming.

6CH04 Process Equipment Design & Drawing

CO1	Knowledge of basics of process equipment design and important parameters of equipment design
CO2	Ability to design internal pressure vessels and external pressure vessels
CO3	Ability to design special vessels (e.g. tall vessels) and various parts of vessels (e.g. heads)
CO4	Knowledge of equipment fabrication and testing methods.

6CH05 Non conventional energy source

CO1	To explain various concept of Renewable energy solar energy
CO2	To choose the appropriate renewable energy as an alternate for conventional power in any application that is wind energy
CO3	Biomass resources and their classification chemical constituents and physicochemical characteristics of biomass - Biomass conversion processes - Thermo chemical conversion:
CO4	Thermodynamics and electrochemical principles - basic design, types, and applications, production methods, hydrogen and fuel cells and Biophotolysis
CO5	Other Types of Energy that is Ocean energy resources, principles of ocean thermal energy conversion systems, ocean thermal power plants, principles of ocean wave energy conversion and tidal energy conversion
CO6	Analysis of the cost effectiveness of renewable energy sources, present status, comparison, forecast.

6CH08 Mini Project

CO1	The learning outcomes are assessed through an oral examination assessed by one internal examiner and one external examiner.

Semester-VII

7CH-01 Chemical Engineering Operation-III (Mass Transfer-II)

CO1	To study the liquid – liquid extraction process for different mixture solution
CO2	To study the extractor for liquid-liquid Extraction process
CO3	To study the Leaching process for solid material
CO4	To study different types of Distillation method
CO5	To study minimum And maximum reflux ratio for process
CO6	To study the design of Packed distillation column.

7CH02 Chemical Reaction Engineering-I

CO1	Develop rate laws for homogeneous reactions
CO2	Design of ideal reactors for single and complex reactions
CO3	Develop skills to choose the right reactor among single, multiple, recycle reactor, etc. schemes.

CO4	Design of non-isothermal reactors and the heat exchange equipment required.

7CH03 Process Dynamic & Control

CO1	Transmit response of control systems, optimization.
CO2	Stability, Root locus, Transient response. Application of root locus to control system. Frequency response methods, Design of Nyquist criteria.
CO3	Process applications, Controller mechanisms
CO4	Development and control systems for various chemical industries case studies
CO5	Introduction on advanced control techniques as feed forward, control, cascade control, ratio control, adaquative control and digital computer control.
CO6	Dynamics and control of chemical equipments such as heat exchangers, distillation columns, absorption column, etc

7CH 04 Industrial Waste Treatment.

CO1	Understand the different types of wastes generated in an industry, their effects on living and non-living things.
CO2	Understand environmental regulatory legislations and standards and climate changes.
CO3	Understand about the quantification and analysis of wastewater and treatment.
CO4	Understand the different unit operations and unit processes involved in conversion of highly polluted water to potable standards.
CO5	Understand the atmospheric dispersion of air pollutants, and operating principles, design calculations of particulate control devices.
CO6	Understand about analysis and quantification of hazardous and nonhazardous solid waste wastes, treatment and disposal.

7CH04 Plant Design & Project Engineering

CO1	Understand concepts of process design and project management
CO2	Synthesize feasible and optimum flow-sheet
CO3	Estimation of capital investment, total product costs, and profitability.
CO4	Optimum design of equipments based on economics and process considerations.

Semester-VIII

8CH01 Transport Phenomena

CO1	Understanding of transport processes.
CO2	Ability to do heat, mass and momentum transfer analysis.
CO3	Ability to analyze industrial problems along with appropriate boundary conditions.
CO4	Ability to develop steady and time dependent solutions along with their limitations.

8CH 02 Chemical Reaction Engineering –II

CO1	To distinguish between various RTD curves and predict the conversion from a non-ideal reactor using tracer information.
CO2	Develop rate laws for heterogeneous reactions
CO3	Design of reactors for non-catalytic and catalytic reactions.
CO4	Design of towers for gas–liquid operations with and without chemical reaction.

8CH03 System Modeling

CO1	Understand the important physical phenomena from the problem statement
CO2	Develop model equations for the given system
CO3	Demonstrate the model solving ability for various processes/unit operations
CO4	Demonstrate the ability to use a process simulation
CO5	Identify different types of optimization problems
CO6	Understanding of different optimization technique and Ability to solve various multivariable optimization problems.

8CH04 Elective * (Petrochemical technology)

CO1	History, Economics and future of petrochemical energy crises

CO2	First generation Petrochemicals, olefins, alkenes and alkynes
CO3	Second generation petrochemicals: synthesis and properties
CO4	Third generation petrochemicals: Synthesis and properties
CO5	Miscellaneous petrochemicals like petroleum, proteins, and synthesis, detergent, resin and rubber chemicals
CO6	Technological forecasting of petroleum and petrochemicals

8CH06 project & Seminar

CO1	**Seminar** The learning outcomes are assessed through quality of searching the topics, presentation skills, understanding and report writing.