DEPARTMENT OF CSE - A.Y: 2017-18

Program Outcomes

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	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.
PO3	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.
PO4	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.
PO5	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.
PO6	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.
PO7	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.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.
PO11	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.

PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes

PSO1	Apply mathematical foundations, algorithmic principles, and theoretical computer science in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
PSO2	Demonstrate understanding of the principles and working of the hardware and software aspects of computer systems.
PSO3	Use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations

COURSE OUTCOMES

COURSE		COURSE OUTCOME STATEMENT
English	CO1	Students will be able to read and comprehend seen and unseen passages and answer questions based on them.
	CO2	Students will be able to interpret the content of a passage and state their perspective.
	CO3	Students will be able to understand words and their meanings, and know prefixes, suffixes, analogies, synonyms, antonyms and one word substitutes.
	CO4	Students will be able to use articles, quantifiers, gerunds, infinitives, present participles and tenses appropriately.
	CO5	Students will be able to write sentences, paragraphs, formal letters, emails, short essays on any given topic.
Engineering Mathematics-I	CO1	Solve the 1st order differential equations by identifying the suitable method.
	CO2	Identify and solve a 2nd and higher order differential equations and perform simple applications in Engineering.
	CO3	Estimate the maxima and minima of two variable functions under different constraints.
	CO4	Solve a multiple integral and apply to estimate the volume and surface area of the solids.
	CO5	Calculate grad, divergence, curl; a line, surface and volume integral. To find work done, area, and volume. Apply the vector integral theorems to evaluate multiple integrals.
Computer Programming	CO1	Understand the fundamentals of C programming.
	CO2	Choose the loops and decision making statements to solve the problem.
	CO3	Implement different operations on arrays and solve problems using functions.
	CO4	Understand pointers, structures and unions.
	CO5	Implement file operations in C programming for a given application.

Electrical & Electronics Engineering	CO1	Analyze electrical circuits for both DC and AC
	CO2	Generalize A.C machines.
	CO3	Identify and Discuss different types of dc generators
	CO4	Classify different types of measuring instruments.
	CO5	Outline semiconductor devices.
Engineering Drawing	CO1	Construct polygons, ellipse and scales (plain, diagonal, vernier).
	CO2	Draw orthographic projection of points and straight lines in any quadrant, and determine its true length and true inclination.
	CO3	Draw projections of plane surfaces inclined to either one or both reference planes.
	CO4	Draw projections of simple solids inclined to one reference plane.
	CO5	Convert orthographic views into isometric projections and vice-versa.
Engineering Physics	CO1	Apply the principles of optics in designing optical devices
	CO2	Outline the Principles of Lasers and Fiber Optics
	CO3	Resolve the discrepancies in classical estimates through quantum principles
	CO4	Interpret the knowledge of Magnetic Properties in Material Fabrication
	CO5	Explain the response of E-Field on Dielectric Materials to control the device performance
Computer Programming Lab	CO1	Solve the given problem using the syntactical structures of C language
	CO2	Develop , execute and document computerized solution for various problems using the features of C language
	CO3	Design programs involving decision structures and loops.
	CO4	Implement modularity and code reusability concepts using functions.
	CO5	To read and write C program that uses pointers, structures and files
Engineering Physics Lab	CO1	infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
	CO2	apply classic experimental techniques to comprehend the Phenomenon of resonance with equipment such as sonometer, Melde’s apparatus and volume resonator to measure desired properties
	CO3	demonstrate the ability to measure properties of optical systems and design Instrumentation thereof with targeted accuracy for physical measurements
	CO4	illustrate Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
	CO5	evaluate characteristics of magnetic, dielectric and semiconducting material devices
Basic English Lang. Comm. Skills Lab	CO1	Students will be able to pronounce words accurately based on the knowledge of speech sounds and use appropriate intonation patterns in speech.

	CO2	Students will be able to comprehend audio and video clips of different accents.
	CO3	Students will be able to describe / discuss / explain a given situation / context well.
	CO4	Students will be able to read and recall what they have read.
	CO5	Students will be able to understand and interpret information provided in graphs, tables etc.
English Communication Practice	CO1	Students will be able to use grammar appropriately in speech and writing.
	CO2	Students will be able to describe, discuss, explain and interpret a given situation / context effectively.
	CO3	Students will be able to read texts and listen to lectures and make notes on them.
	CO4	Students will be able to apply reading techniques in their other Course s.
	CO5	Students will be able to summarize, paraphrase and review a piece of writing efficiently.
Engineering Mathematics-II	CO1	Solve the algebraic and transcendental equations by identifying suitable numerical methods, estimate a linear and non-linear curve to the given data by the method of least squares, calculate the value of dependent variable for a particular x by deducing the unknown function y = f(x) for an evenly or unevenly spaced points.
	CO2	Estimate the value of derivatives, evaluate the definite integrals using different numerical methods and evaluate an IVP.
	CO3	Deduce Laplace transform of different continuous functions using different properties and solve an I.V.P & B.V.P applying Laplace transform.
	CO4	Deduce the Fourier series and half range series expansions of different functions for different intervals.
	CO5	Solve a linear and non-linear 1st order partial differential equation and using method of separation of variables evaluate a wave equation & heat equation
Environmental Studies	CO1	Recognize the general issues of environment and know how to conserve the environment, speaks better on the structural issues and list out the resources, present status and their better usage.
	CO2	Explain the interdependency of life in the ecosystem, demonstrate the structural and functional setup, classify and appraise the importance of diversity on the earth and differentiate the conservation methods.
	CO3	Examine the various types of pollutants and their impacts along with their control methods; review the different types of solid wastes, impacts and their eco friendly disposal methods.
	CO4	Translate the concept of sustainable development by green technologies, experiment on the environmental management systems for clean, green, safe and healthy environment through clean development mechanisms.

	CO5	Evaluate the changing trends of population curves among different nations, discuss how to limit the current population size, collect and compile the information to document the environmental assets.
Data Structures	CO1	Design appropriate algorithms for various data processing problems.
	CO2	Implement various searching and sorting techniques.
	CO3	Apply data structures like stacks and queues to solve various computing problems.
	CO4	Devise programs using linear data structures.
	CO5	Develop and apply various non-linear data structures like trees and graphs to solve various computing problems.
Engineering Mechanics	CO1	Know the system of forces and calculate the resultant of different force system.
	CO2	Draw the free body diagram and understand the concept of moment and couple.
	CO3	Know the friction between two mating surfaces and calculate cetroid of plane areas.
	CO4	Determine area and mass moment of inertia for different sections.
	CO5	Determine the kinematic relations of particles & rigid bodies
Engineering Chemistry	CO1	Student will differentiate different moulding techniques of plastic materials.
	CO2	Students can able to determine total hardness of water by EDTA method.
	CO3	Students can able to design the metallic materials to prevent corrosion.
	CO4	Student will apply suitable lubrication mechanisms for various machinery parts.
	CO5	Students will demonstrate the working of PV cell.
Data Structures Lab	CO1	Develop programs as recursive solutions for basic routine problems.
	CO2	Demonstrate different strategies to solve the most common searching and sorting problems.
	CO3	Design programs that use data structures such as arrays, linked lists, stacks, queues, and solve applications like Infix-to-Postfix conversion.
	CO4	Develop programs for implementing various operations on binary trees and binary search trees.
	CO5	Solve traversal problems on graphs using BFS, DFS
Engineering Chemistry Lab	CO1	Students can able to determine D.O., Turbidity etc of water sample.
	CO2	Students can explain the importance of viscosity, Flash point and Acid value of a lubricant.
	CO3	Students will determine the amount of acid or base by pH metric and conductometric titrations.
	CO4	Students have the capacity to determine the hardness of various water samples.
	CO5	Students can able to operate all the instruments in the chemistry laboratory.

Information Technology Workshop Lab	CO1	Students gain knowledge on computer system such as system Unit, input devices, and output devices connected to the computer.
	CO2	Students gain knowledge to understand the booting process that includes switching on the system, and familiar with all the commands of an operating system.
	CO3	Students gain knowledge to understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers and search engines etc.
	CO4	Students get familiarize with parts of Word window, To create and save a document, To set page settings, create headers and footers, To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.
	CO5	Students get familiarize with parts of Excel window, to create and save a workbook with single and/or multiple worksheets, to apply operations on range of cells using built-in formulae, etc.
Probability and Statistics	CO1	Can apply Baye's theorem to solve industry related problems, understand the properties of Discrete and Continuous distributions.
	CO2	Can calculate the characteristics of probability distribution under different conditions using Binomial, Poisson and Normal.
	CO3	Can define the hypothesis, identify appropriate test and apply in a range of statistical test.
	CO4	Can construct relation between two sets of data, identify and draw control charts and comment on the data.
	CO5	Can identify and apply the queuing model in our day to day life.
Math. Foundations of Computer Science	CO1	Apply equivalence formula and tautological implications in finding normal forms, theory of inference and differentiate propositional logic and predicates.
	CO2	Explain basic properties, theorems of number theory and mathematical induction and apply the same in solving problems.
	CO3	Identify the basic properties of graphs and related structures and solve the related problems.
	CO4	Explain the basic properties, theorems in algebraic systems(Groups and its homomorphism, co-set decomposition),POSETS, LATTICES and apply the same in solving the problems.
	CO5	Solve and formulate recurrence relations(Linear and Homogeneous)
Digital Logic Design	CO1	Understand the conversions in number system and Develop the logic circuits using logic gates.
	CO2	Minimize the boolean logic circuits using K-map and Analyze the operation of combinational arithmetical circuits like adders, subtractors, carry look ahead adder and binary multiplier.
	CO3	Consrtuct and analyze the operation of combinational logic circuits like Mux, Demux, Encoder, Decoder and Comparator etc..
	CO4	Develop the various programmable logic devices like PLA,PAL and PROM.
	CO5	Develop the various types of sequential logic circuits like flip flops, registers and counters.

Object Oriented Programming	CO1	Illustrate the concept of OOP as well as the purpose and usage principles of Inheritance, Polymorphism and encapsulation.
	CO2	Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
	CO3	Design and develop programs using packages and interfaces.
	CO4	Develop the mechanism of Exception Handling and multithread
	CO5	Implements the concept of Event Handling and GUI interfaces using Java Swings.
Free Open Source Software	CO1	Able to write and debug Python programs which make use of the fundamental control structures and method-building techniques common to all programming languages.
	CO2	Able to use data types, input, output, iterative, conditional, and functional components of the language in his or her programs.
	CO3	Able to use sequences and files in python script.
	CO4	Able to implement basic perl programs using control structures.
	CO5	Able to identify the use of packages and sub modules in perl.
Digital Logic Design Lab	CO1	Develop the logic circuits using logic gates.
	CO2	Consrtuct and analyze the operation of combinational logic circuits like Mux, Demux, Encoder, Decoder and Comparator etc..
	CO3	Develop the various types of sequential logic circuits like flip flops and counters.
	CO4	Analyze the various types of registers.
	CO5	Describe the operation of RAM
Free Open Source Software Lab	CO1	Have enough knowledge about available open sources
	CO2	Able to work in open source environments.
	CO3	Have enough knowledge about each open source technology and its importance.
	CO4	Have knowledge on Python, PERL etc,
	CO5	Able to find differences between open sources Vs free software Vs commercial softwares
OOPs through C++ Lab	CO1	Able to write programs with basic constructs of C++.
	CO2	Use Classes and Objects to implement data structure operations.
	CO3	Able to perform different operations like string operations, complex number addition using concepts of OOPs.
	CO4	Able to create new class and reduce complexity for large applications using code reusability.
	CO5	Able to write programs that operate with generic types.
Computer Organization and Architecture	CO1	Describe computer components and understand error detection, error correction method and gain knowledge on data representation in digital computer.
	CO2	Explain central processing unit and knowledge of instruction execution, instruction format and addressing mode and ability to implement different arithmetic operation on digital computer.

	CO3	Ability to understand different types of memory unit such as main memory, cache memory, virtual memory, secondary memory.
	CO4	Ability to understand different type of input output unit and knowledge of how input and output unit will be connected to CPU and mode of data transfer from CPU to memory.
	CO5	Distinguish parallel processing and multiprocessor in computer system and knowledge of interconnection structure of multiprocessor.
Formal Languages & Automata Theory	CO1	Construct the finite automata with & without output and minimize the finite automata.
	CO2	Convert finite automata into regular expression and vice versa.
	CO3	Design grammars for regular and context free languages.
	CO4	Explain the equivalence between CFG and PDA & equivalence between acceptance by final state and acceptance by empty stack of PDA.
	CO5	Design & Classify Turing Machines and determine the decidability of computational problems
Database Management Systems	CO1	Recognize the Advantages and applications of DBMS.
	CO2	Design and implement a Database Schema for a given Problem-domain
	CO3	Construct Queries using SQL to retrieve required information from Database
	CO4	Use Normalization Techniques on given Database Design to avoid Anomalies
	CO5	Summarize Concurrent Executions, Serializability, Recoverability of Transactions
Operating Systems	CO1	Explain the different structures of operating system and design various scheduling algorithms
	CO2	Propose solutions for achieving process synchronization and design deadlock prevention, detection, avoidance algorithms
	CO3	Compare and contrast various memory management schemes
	CO4	Design and Implement file system
	CO5	Familiarize with disk scheduling, device drivers, protection and security mechanisms
Principles of Programming Languages	CO1	Explain program translation process and specify syntax.
	CO2	Explain and differentiate scope, bindings and specify semantics of a programming language.
	CO3	Select among various data types and control flow constructs in a language.
	CO4	Describe various concurrency, synchronization and control abstraction mechanisms
	CO5	Design a program in object oriented programming language, functional language and logic program language.

Operating Systems Lab	CO1	To use of an operating system to develop software
	CO2	To write software systems based on multiple cooperating processes or threads
	CO3	To implement file organization techniques
	CO4	To implement file allocation strategies
	CO5	To implement process scheduling & synchronization algorithms
Database Management Systems Lab	CO1	Design Logical Database Schema without Anomalies.
	CO2	Compose complex Queries to retrieve required information from Database
	CO3	Devise Triggers to implement various complex Database Constraints
	CO4	Compose PL/SQL Procedures using cursors
	CO5	Design Procedures, Functions and Packages for required Database tasks.
Adv. English Lang. Comm. Skills Lab	CO1	Students will be able to recognize and compare various socio-cultural and professional contexts appropriately.
	CO2	Students will be able to evaluate their own performance participating well in GDs and other language-related activities.
	CO3	Students will be able to experiment language more effectively and carry out various competitive examinations well.
	CO4	Students will be able to compose the ideas relevantly and coherently.
	CO5	Students will be able to discuss and report various situations efficiently.
Database Management Systems Lab	CO1	Design Logical Database Schema without Anomalies.
	CO2	Compose complex Queries to retrieve required information from Database
	CO3	Devise Triggers to implement various complex Database Constraints
	CO4	Compose PL/SQL Procedures using cursors
	CO5	Design Procedures, Functions and Packages for required Database tasks.
Industrial Management Science	CO1	Help students to learn the overview of principles of management and its applications.
	CO2	Enable the student to understand the business and new economic environment and its applications in capital budgeting.
	CO3	Help students to learn the overview of managerial economics and its applications.
	CO4	Familiarize students with theory of production and cost concept.
	CO5	Help students to understand the concept of market structures, types of competition and pricing strategies.
Compiler Design	CO1	Understand the theory and practice of compilation, in particular, the lexical analysis, syntax, and semantic analysis, code generation and optimization phases of Compilation.

	CO2	Apply lexical rules and grammars for a programming language.
	CO3	Analyze and implement a lex without using Flex or any other lex generation tools.
	CO4	Develop a parser such as a bottom-up SLR parser without using YACC or any other compiler-generation tools.
	CO5	Design semantic rules into a parser that performs attribution while parsing.
Computer Networks	CO1	Identify and enumerate different types of network topologies, protocols and the layers of the OSI and TCP/IP models and explain the functions of each layer.
	CO2	Explain the protocols of Data Link Layer and MAC Sublayer and illustrate how a network can detect and correct transmission errors.
	CO3	Classify and compare the major routing and congestion control algorithms and understand how a packet is routed over the internet.
	CO4	Describe how TCP and UDP function, its uses and summarize the differences between them.
	CO5	Analyze the features and operations of various Application layer protocols such as http, DNS, and SMTP.
Design and Analysis of Algorithms	CO1	Measure the performance and calculate the Time & Space complexities of algorithms.
	CO2	Design effective algorithms based on Divide and Conquer and Greedy methods.
	CO3	Discuss various problems suitable to Dynamic programming.
	CO4	Construct a state space tree to solve different problems using Backtracking technique.
	CO5	Find an optimal solution by applying different Branch and Bound techniques and illustrate Non-deterministic algorithms.
Operating Systems	CO1	Explain the different structures of operating system and design various scheduling algorithms
	CO2	Propose solutions for achieving process synchronization and design deadlock prevention, detection, avoidance algorithms
	CO3	Compare and contrast various memory management schemes
	CO4	Design and Implement file system
	CO5	Familiarize with disk scheduling, device drivers, protection and security mechanisms
Compiler Design Lab	CO1	Understand and apply the knowledge of lex tool & YACC tool to develop a scanner & parser
	CO2	Design & conduct experiments for Intermediate Code Generation in compiler.
	CO3	Analyze and translate the knowledge of patterns, tokens & regular expressions for solving problems.
	CO4	Identify the new code optimization techniques to improve the performance of a program in terms of speed & space.
	CO5	Apply the new tools and technologies used for designing a compiler.
Operating Systems Lab	CO1	To use of an operating system to develop software

	CO2	To write software systems based on multiple cooperating processes or threads
	CO3	To implement file organization techniques
	CO4	To implement file allocation strategies
	CO5	To implement process scheduling & synchronization algorithms
Computer Networks Lab	CO1	To apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.
	CO2	Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.
	CO3	Understand and building the skills of routing mechanisms during packet delivery.
	CO4	To explain the congestion control algorithms and understand how a packet is routed.
	CO5	To be familiar with network tools and network programming.
Data Warehousing & Data Mining	CO1	Recognize types of Data, Data Quality, need of Preprocessing and different measures of similarity and dissimilarity.
	CO2	Differentiate between methods for modeling Multidimensional Data, design and implement Data Warehouse.
	CO3	Explain in detail major techniques and algorithms involved in Data Mining including techniques and algorithms for Data Preprocessing, Association Rule Mining, Data Classification and Data Clustering.
	CO4	Evaluate and improve the performance of a Classifier.
	CO5	Compare and contrast Partitioning, Hierarchical and Density based Clustering Algorithms.
Web Technologies	CO1	Understand and build Web pages using HTML
	CO2	Apply styles to web pages and validate the forms using JavaScript
	CO3	Design and Develop a parser that retrieve data from XML Files.
	CO4	Apply their computer science skills to the create a website with some understanding of the legal, security, commercial, marketing and other issues involved.
	CO5	Understand ways of using different web technologies
Network Security & Cryptography	CO1	Recall different Security Attacks, Services and Mechanisms
	CO2	Classify and explain categories of different encryption and decryption techniques
	CO3	Identify the authentication applications such as Kerberos and x.509 directory services and Analyze the representation of PGP and S/MIME
	CO4	Familiar with the importance of IP Security and Web Security
	CO5	Exposed to viruses and related threats and design principles of firewalls
Computer Graphics	CO1	Identify and describe what resolution and type of graphics routines are used in any given graphics display.
	CO2	Demonstrate routines for generating different output primitives including: drawing lines, conic sections, polygons, other routines for polygon filling.

	CO3	Apply 2D transformations like translate, rotate, and scale to manipulate images, and also perform clipping. Also implement Pipeline phases in 2D.
	CO4	Generate 3D computer graphics using interpolation and approximation functions. And derive Projection Transformations.
	CO5	Detect visible surfaces using various routines, thus hiding back faces in 3D graphics, and generate Computer Animation.
Unix Programming	CO1	Work confidently on writing shell scripts by using shell environment.
	CO2	Tell the difference between conventional function calls versus system calls in UNIX and classify system calls in UNIX.
	CO3	Describe the relation of a concept of a process and knows handling of a process by using signals.
	CO4	Define mechanisms for local and remote inter-process communication in UNIX and implement the client-server paradigm of computing with mechanisms of IPC.
	CO5	Identify the System calls for synchronization, protection, and interrupts of any UNIX.
Software Project Management	CO1	Infer knowledge on Hardware and System Design concepts and to reconstruct the CM-2 architecture and its functionality.
	CO2	Design E-cube routing in Hypercube computers and X-Y routing in 2-D mesh.
	CO3	Justify identify permissible latencies and forbidden latencies for the given non-linear pipeline.
	CO4	Learning about the different architectures like CISC & RISC and distinguish between the RISC and CISC architectures.
	CO5	Design the input-output connections in an Omega Network using perfect shuffle method.
Web Technologies Lab	CO1	Understand and build a complete website using HTML ,
	CO2	Apply CSS and JavaScript for creation and validation of developing web pages.
	CO3	Design and Develop applications to store and retrieve data from XML files.
	CO4	Implement a dynamic website by using the Servlets and JSP
	CO5	Design and develop database applications
Unix Programming Lab	CO1	Remember how Unix File Structure is organized, familiarize with UNIX commands, and implement shell scripts.
	CO2	Classify system calls in UNIX
	CO3	Analyze the concepts of process, threads, and file structure.
	CO4	Implement IPC using pipes, semaphores, Shared Memory and messages.
	CO5	Create Client / Server applications using sockets
UML & Design Patterns	CO1	Illustrate the use of unified modeling language for object oriented analysis and design
	CO2	Know the syntax of different UML diagrams.
	CO3	Apply object oriented analysis and design to build a software system
	CO4	Classify and document design patterns

	CO5	Paraphrase patterns to manage algorithms and assign responsibilities to objects.
Mobile Computing	CO1	Discover the characteristics of pervasive computing applications including the major system components and architectures of the systems
	CO2	Analyze the strengths and limitations of the tools and devices for development of pervasive computing systems
	CO3	Explore the characteristics of different types of mobile networks on the performance of a pervasive computing system
	CO4	Analyze and compare the performance of different data dissemination techniques and algorithms for mobile real-time applications
	CO5	Develop an attitude to propose solutions with comparisons for problems related to pervasive computing system through investigation
Open Source Software	CO1	Design and configure the Linux system
	CO2	Able to work in Linux platform.
	CO3	Configure the different categories of servers.
	CO4	Able to develop web applications in open source environment.
	CO5	Able to develop own software modules by customizing the existing open source software
Image Processing	CO1	Explain basic concepts in Image processing and various color models
	CO2	Apply Spatial domain techniques for Image Enhancement
	CO3	List the Image compression Techniques
	CO4	Discuss various morphological Algorithms
	CO5	Classify various Image segmentation techniques
Cyber Laws	CO1	Understand about security policies, latest crimes and different offences.
	CO2	Analyze the activities of fraud prevention, monitoring, investigation and report.
	CO3	Differentiate among the models, architectures, challenges and global legal constraints of
	CO4	Secure electronic commerce technologies.
	CO5	Have knowledge of cyber law and ethics
UML & Design Patterns Lab	CO1	Create different UML diagrams for a software system
	CO2	Analyze and design a software system in an object oriented style using tools like Rational Rose.
	CO3	Classify and document different design patterns
	CO4	Apply design patterns to solve design problems.
Mobile Application Development Lab	CO1	Design and implement the user interfaces of mobile applications
	CO2	Evaluate and contrast requirements for mobile platforms to establish appropriate strategies for development and deployment.
	CO3	Understanding and apply the key technological principles and methods for delivering and maintaining mobile application
	CO4	Design mobile application that demonstrate different layout designs in android application

	CO5	Apply Java programming concepts to Android application development
OSS LAB	CO1	Have enough knowledge about available open sources
	CO2	Able to work in open source environments.
	CO3	Have enough knowledge about each open source technology and its importance.
	CO4	Have knowledge of PHP, MySQL etc,
	CO5	Able to find differences between open sources vs free software vs commercial..
Software Testing Methodologies	CO1	Classify different types of bugs and able to explain the purpose of testing
	CO2	Identify best approach during testing.
	CO3	Calculate the mean processing time and weight.
	CO4	identify the states of a product whether good or bad.
	CO5	design optimal graph with node reduction procedure.
Human Computer Interaction	CO1	Explain the human components functions regarding interaction with computer.
	CO2	Describe what interaction design is and how it relates to human computer interaction and other fields.
	CO3	Explain Computer components functions regarding interaction with human.
	CO4	Demonstrate Understanding of Interaction between the human and computer components.
	CO5	Describe how technologies can be designed to change people's attitudes and behavior
Mobile Adhoc & Sensor Networks	CO1	Describe the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
	CO2	Distinguish how routing protocols function and their implications on data transmission delay and bandwidth consumption in ad hoc network.
	CO3	Compute the different clustering algorithms and their usefulness for network management and routing.
	CO4	Operate the different ad hoc network security issues.
	CO5	Describe the principles and characteristics of wireless sensor networks (WSNs).
PROJECT WORK	CO1	Select relevant information from various sources including internet, library, journals, Computer Science magazines to define the problem.
	CO2	Comprehend principles pertaining to Computer Science and Engineering that enables him/her to complete the project.
	CO3	Gain technology implementation skills by applying them to a new problem which may be the design and manufacture of a product, a research investigation, experimental, software or management project by using advanced equipment and software.
	CO4	Work as an individual and as a team including division of tasks, scheduling and monitoring the progress.
	CO5	Adhere to professional standards and ethics.
	CO6	Research various avenues for solving issues that arise during project implementation thereby inculcate lifelong learning.

CO7	Write effective technical reports and demonstrate his/her work.

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PO7	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.
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PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.

PO11	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.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes

PSO1	Execute the mathematical foundations, algorithmic principles of engineering to identify, formulate, design and investigate the intricate problems of Information and Technology.
PSO2	Comprehend the principles and applications of the software and hardware facets of computer systems.
PSO3	Apply knowledge in various domains to identify research gaps and provide solutions.

COURSE OUTCOMES

Course Title		Description of the Course Outcome
English	CO1	Students will be able to read and comprehend seen and unseen passages and answer questions based on them.
	CO2	Students will be able to interpret the content of a passage and state their perspective.
	CO3	Students will be able to understand words and their meanings, and know prefixes, suffixes, analogies, synonyms, antonyms and one word substitutes.
	CO4	Students will be able to use articles, quantifiers, gerunds, infinitives, present participles and tenses appropriately.
	CO5	Students will be able to write sentences, paragraphs, formal letters, emails, short essays on any given topic.
Engineering Mathematics-I	CO1	Solve the 1^{st} order differential equations by identifying the suitable method.
	CO2	Identify and solve a 2^{nd} and higher order differential equations and perform simple applications in Engineering.
	CO3	Estimate the maxima and minima of two variable functions under different constraints.
	CO4	Solve a multiple integral and apply to estimate the volume and surface area of the solids.
	CO5	Calculate grad, divergence, curl; a line, surface and volume integral. To find work done, area, and volume. Apply the vector integral theorems to evaluate multiple integrals.
Computer Programming	CO1	Understand the fundamentals of C programming.
	CO2	Choose the loops and decision making statements to solve the problem.

	CO3	Implement different operations on arrays and solve problems using functions.
	CO4	Understand pointers, structures and unions.
	CO5	Implement file operations in C programming for a given application.
Electrical & Electronics Engineering	CO1	Ability to analyze electrical circuits for both DC and AC
	CO2	Ability to generalize A.C machines.
	CO3	Identify and Discuss different types of dc generators
	CO4	Classify different types of measuring instruments.
	CO5	To outline semiconductor devices.
Engineering Drawing	CO1	Construct polygons, ellipse and scales (plain, diagonal, vernier).
	CO2	Draw orthographic projection of points and straight lines in any quadrant, and determine its true length and true inclination.
	CO3	Draw projections of plane surfaces inclined to either one or both reference planes.
	CO4	Draw projections of simple solids inclined to one reference plane.
	CO5	Convert orthographic views into isometric projections and vice-versa.
Engineering Physics	CO1	Apply the principles of optics in designing optical devices.
	CO2	Outline the Principles of Lasers and Fiber Optics.
	CO3	Resolve the discrepancies in classical estimates through quantum principles.
	CO4	Interpret the knowledge of Magnetic Properties in Material Fabrication.
	CO5	Explain the response of E-Field on Dielectric Materials to control the device performance.
Computer Programming Lab	CO1	Solve the given problem using the syntactical structures of C language
	CO2	Develop , execute and document computerized solution for various problems using the features of C language
	CO3	Design programs involving decision structures and loops.
	CO4	Implement modularity and code reusability concepts using functions.
	CO5	To read and write C program that uses pointers, structures and files
Engineering Physics Lab	CO1	Infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum.
	CO2	Apply classic experimental techniques to comprehend the Phenomenon of resonance with equipment such as sonometer, Melde’s apparatus and volume resonator to measure desired properties.
	CO3	Demonstrate the ability to measure properties of optical systems and design instrumentation with precision measurements to estimate error for targeted accuracy
	CO4	Illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics.

	CO5	Evaluate characteristics of magnetic, dielectric and semiconducting material devices.
Basic English Communication Skills Lab	CO1	Students will be able to pronounce words accurately based on the knowledge of speech sounds and use appropriate intonation patterns in speech.
	CO2	Students will be able to comprehend audio and video clips of different accents.
	CO3	Students will be able to describe / discuss / explain a given situation / context well.
	CO4	Students will be able to read and recall what they have read.
	CO5	Students will be able to understand and interpret information provided in graphs, tables etc.
English Communication Practice	CO1	Students will be able to use grammar appropriately in speech and writing.
	CO2	Students will be able to describe, discuss, explain and interpret a given situation / context effectively.
	CO3	Students will be able to read texts and listen to lectures and make notes on them.
	CO4	Students will be able to apply reading techniques in their other Course s.
	CO5	Students will be able to summarize, paraphrase and review a piece of writing efficiently
Engineering Mathematics-II	CO1	Solve the algebraic and transcendental equations by identifying suitable numerical methods, estimate a linear and non-linear curve to the given data by the method of least squares, calculate the value of dependent variable for a particular x by deducing the unknown function $y = f(x)$ for an evenly or unevenly spaced points.
	CO2	Estimate the value of derivatives, evaluate the definite integrals using different numerical methods and evaluate an IVP.
	CO3	Deduce Laplace transform of different continuous functions using different properties and solve an I.V.P & B.V.P applying Laplace transform.
	CO4	Deduce the Fourier series and half range series expansions of different functions for different intervals.
	CO5	Solve a linear and non-linear 1^{st} order partial differential equation and using method of separation of variables evaluate a wave equation & heat equation.
Environmental Studies	CO1	Recognize the general issues of environment and know how to conserve the environment, speaks well again on various resources, present status and their better usage.
	CO2	Explain the interdependency of life in the ecosystem, demonstrate the structural and functional setup, classify and appraise the importance of diversity on the earth and differentiate the conservation methods.
	CO3	Examine the various types of pollutants and their impacts along with their control methods; review the different types of solid wastes, impacts and their ecofriendly disposal methods.

	CO4	Translate the concept of sustainable development by green technologies, experiment on the environmental management systems for clean, green, safe and healthy environment through clean development mechanisms.
	CO5	Evaluate the changing trends of population curves among different nations, discuss how to limit the current population size, collect and compile the information to document the environmental assets.
Data Structures	CO1	Design appropriate algorithms for various data processing problems.
	CO2	Implement various searching and sorting techniques.
	CO3	Apply data structures like stacks and queues to solve various computing problems.
	CO4	Devise programs using linear data structures.
	CO5	Develop and apply various non-linear data structures like trees and graphs to solve various computing problems.
Engineering Mechanics	CO1	Know the system of forces and calculate the resultant of different force system.
	CO2	Draw the free body diagram and understand the concept of moment and couple.
	CO3	Know the friction between two mating surfaces and calculate cetroid of plane areas.
	CO4	Determine area and mass moment of inertia for different sections.
	CO5	Determine the kinematic relations of particles & rigid bodies.
Engineering Chemistry	CO1	Student will differentiate different moulding techniques of plastic materials.
	CO2	Students can able to determine total hardness of water by EDTA method.
	CO3	Students can able to design the metallic materials to prevent corrosion.
	CO4	Student will apply suitable lubrication mechanisms for various machinery parts.
	CO5	Students will demonstrate the working of PV cell.
Data Structures Lab	CO1	Develop programs as recursive solutions for basic routine problems.
	CO2	Demonstrate different strategies to solve the most common searching and sorting problems.
	CO3	Design programs that use data structures such as arrays, linked lists, stacks, queues, and solve applications like Infix-to-Postfix conversion.
	CO4	Develop programs for implementing various operations on binary trees and binary search trees.
	CO5	Solve traversal problems on graphs using BFS, DFS.
Engineering Chemistry Lab	CO1	Students are able to determine D.O. and Turbidity of water samples.
	CO2	Students can explain the importance of viscosity, Flash point and Acid value of a lubricant.
	CO3	Students will determine the amount of acid or base by pH metric and conductometric titrations.
	CO4	Students are able to determine the hardness of various water samples.

	CO5	Students can able to operate all the instruments in the chemistry Laboratory analysis.
Information Technology Workshop Lab	CO1	Students gain knowledge on computer system such as system Unit, input devices, and output devices connected to the computer.
	CO2	Students gain knowledge to understand the booting process that includes switching on the system, and familiar with all the commands of an operating system.
	CO3	Students gain knowledge to understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers and search engines etc.
	CO4	Students get familiarize with parts of Word window, To create and save a document, To set page settings, create headers and footers, To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.
	CO5	Students get familiarize with parts of Excel window, to create and save a workbook with single and/or multiple worksheets, to apply operations on range of cells using built-in formulae, etc.
	CO6	Students get familiarize with parts of PowerPoint win, to create and save a new presentation, apply design templates to a presentation, to insert, edit and delete a slide , etc.
Probability and Statistics	CO1	Describe probability distribution for a range of random variables for discrete and continuous and apply the Baye's theorem on industrial related problems.
	CO2	Calculate the different characteristics of probability distributions under different conditions using Binomial, Poisson and Normal.
	CO3	Calculate sample related values, identify a statistic and its sampling distribution, and calculate standard error, point & interval estimations.
	CO4	Construct the hypothesis, identify appropriate test and apply in a range of statistical test.
	CO5	Apply appropriate tabular and graphical formats for displaying univariate (bivariate) data sets and carry out correlation, regression analysis.
Mathematical Foundations of Computer Science	CO1	Apply, equivalence formula, tautological implications in finding normal forms, theory of inference and differentiate propositional logic and predicates, and explain Mathematical Induction principle and apply the same.
	CO2	Explain the basic properties of relations (POSETS, LATTICES and apply the same in solving the problems) and functions.
	CO3	Identify the basic properties of graphs and related structures and solve the related problems.
	CO4	Identify the basic properties of Trees and solve minimum cost spanning tree problems.
	CO5	Solve and formulate, generating functions and recurrence relations.
Digital Logic Design	CO1	Distinguish different number systems and digital codes.
	CO2	Design different arithmetic logic gates.

	CO3	Distinguish different combinational logic circuits and design logic circuits using these combinational circuits
	CO4	Design logic circuits using PLDs.
	CO5	Distinguish different sequential logic circuits and design logic circuits using these sequential circuits.
Object Oriented Programming	CO1	Explain the difference between object oriented programming and procedural programming and gain basic knowledge on Object Oriented concepts.
	CO2	The students will learn potential C++ features like overloading, constructors and destructors and type conversions in computer problem solving.
	CO3	Understand the principle of code reusability in managing complex software projects.
	CO4	Understand and demonstrate the concepts of object-oriented design, polymorphism to large scale software.
	CO5	Learn syntax, how to utilize standard Templates in writing programs, handle the Exceptions and working with File I/O.
ITSM	CO1	Be able to describe the business value and processes of ICT services in an organisation and apply that knowledge and skill with initiative to a workplace scenario
	CO2	Be able to analyze and evaluate the impact of new and current ICT services to an organisation;
	CO3	Be able to describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organisation;
	CO4	Characteristics of the network that affect user satisfaction.
	CO5	Be able to define, track, and maintain data and data resources.
Free Open Source Software	CO1	Able to write and debug Python programs which make use of the fundamental control structures and method-building techniques common to all programming languages.
	CO2	Able to use data types, input, output, iterative, conditional, and functional components of the language in his or her programs.
	CO3	Able to use sequences and files in python script.
	CO4	Able to implement basic perl programs using control structures.
	CO5	Able to identify the use of packages and sub modules in perl.
Digital Logic Design Lab	CO1	Understand Introduction to Boolean algebra, Binary connectives, Basic Logic Gates, Evaluation of truth functions, Function calculus as Boolean algebra.
	CO2	Design Procedure of Binary Adder-Subtractor, Multiplexers and Demultiplexers.
	CO3	Classifications & model of sequential circuits, latches, Flip-Flops.
Free Open Source Software (FOSS) Lab	CO1	Have enough knowledge about available open sources
	CO2	Able to work in open source environments.
	CO3	Have enough knowledge about each open source technology and its importance.
	CO4	Have knowledge on Python, PERL etc,

	CO5	Able to find differences between open sources Vs free software Vs commercial softwares
OOPs Through C++ Lab	CO1	Able to write programs with basic constructs of C++.
	CO2	Use Classes and Objects to implement data structure operations.
	CO3	Able to perform different operations like string operations, complex number addition using concepts of OOPs.
	CO4	Able to create new class and reduce complexity for large applications using code reusability.
	CO5	Able to write programs that operate with generic types.
	CO6	Able to write programs that performs operations on Files.
Computer Organization and Architecture	CO1	Describe computer components and understand error detection, error correction method and gain knowledge on data representation in digital computer.
	CO2	Explain central processing unit and knowledge of instruction execution, instruction format and addressing mode and ability to implement different arithmetic operation on digital computer.
	CO3	Ability to understand different types of memory unit such as main memory, cache memory, virtual memory, secondary memory.
	CO4	Ability to understand different type of input output unit and knowledge of how input and output unit will be connected to CPU and mode of data transfer from CPU to memory.
	CO5	Distinguish parallel processing and multiprocessor in computer system and knowledge of interconnection structure of multiprocessor.
Formal Languages & Automata Theory	CO1	Construct the finite automata with & without output and minimize the finite automata
	CO2	Convert finite automata into regular expression and vice versa.
	CO3	Design grammars for regular and context free languages.
	CO4	Explain the equivalence between CFG and PDA & equivalence between acceptance by final state and acceptance by empty stack of PDA.
	CO5	Design & Classify Turing Machines and determine the decidability of computational problems
Database Management Systems	CO1	Differentiate Database Systems from File Systems and Define the Terminology, Features, Classifications, Characteristics embodied in Database Systems.
	CO2	Interpret, Design and Implement an E-R Model.
	CO3	Create /Modify the Structure and write optimized SQLQueries to extract and modify Information from Tables or Views.
	CO4	Apply proper Techniques such as Normalization and analyze the applicability of a Specific Normal form in designing a Database.
	CO5	Explain broad range of Database Management issues including Data integrity, Concurrency and Recovery and Compare various Indexing, Hashing and File Organization Techniques.
Operating Systems	CO1	Explain the different structures of operating system and design various scheduling algorithms.

	CO2	Propose solutions for achieving process synchronization and design deadlock prevention, detection, avoidance algorithms.
	CO3	Compare and contrast various memory management schemes.
	CO4	Design and implement file systems.
	CO5	Familiarize with disk scheduling and device drivers.
Principles of Programming Languages	CO1	Explain program translation process, respective tools and specify syntax.
	CO2	Explain and differentiate scope, bindings and specify semantics of a programming language.
	CO3	Select among various data types and control flow constructs in a language.
	CO4	Describe various features of subroutines and control abstraction.
	CO5	Apply Object Oriented Programming concepts to programming
Operating Systems Lab	CO1	To use of an operating system to develop software
	CO2	To write software systems based on multiple cooperating processes or threads
	CO3	To implement file organization techniques
	CO4	To implement file allocation strategies
	CO5	To implement process scheduling & synchronization algorithms
	CO6	To implement memory management scheme like best fit, worse fit etc.
Database Management Systems Lab	CO1	Create relational database.
	CO2	Manipulate data using SQl.
	CO3	Create PL/SQL program.
	CO4	Retrieve required information using SQL.
	CO5	Develop Programs using triggers and cursors.
Advanced English Communication Skills Lab	CO1	Students will be able to state meanings, synonyms, antonyms, analogies, idioms, phrases, one word substitutes, word roots, prefixes and suffixes for words in general.
	CO2	Students will be able to present and interpret data on select topics using pre-existing slides.
	CO3	Students will be able to contribute proactively and extrapolate in group discussions.
	CO4	Students will be able to prepare Résumé / CV and face interview.
	CO5	Students will be able to develop communication skills by playing different roles.
Industrial Management Science	CO1	Help students to learn the overview of principles of management and its applications.
	CO2	Enable the student to understand the business and new economic environment and its applications in capital budgeting.
	CO3	Help students to learn the overview of managerial economics and its applications.
	CO4	Familiarize students with theory of production and cost concept.

	CO5	Help students to understand the concept of market structures, types of competition and pricing strategies.
Compiler Design	CO1	Understand the theory and practice of compilation, in particular, the lexical analysis, syntax,and semantic analysis, code generation and optimization phases of Compilation.
	CO2	Apply lexical rules and grammars for a programming language.
	CO3	Analyze and implement a lex without using Flex or any other lex generation tools.
	CO4	Develop a parser such as a bottom-up SLR parser without using YACC or any other compiler-generation tools.
	CO5	Design semantic rules into a parser that performs attribution while parsing.
Operating Systems	CO1	Explain the different structures of operating system and design various scheduling algorithms
	CO2	Proopose solutions for achieving process synchronization and design deadlock prevention, detection, avoidance algorithms
	CO3	Compare and contrast various memory management schemes
	CO4	Design and Implement file system
	CO5	Familiarize with disk scheduling, device drivers, protection and security mechanisms
Computer Graphics	CO1	Identify and describe what resolution and type of graphics routines are used in any given graphics display.
	CO2	Demonstrate routines for generating different output primitives including: drawing lines, conic sections, polygons, other routines for polygon filling.
	CO3	Apply 2D transformations like translate, rotate, and scale to manipulate images, and also perform clipping. Also implement Pipeline phases in 2D.
	CO4	Generate 3D computer graphics using interpolation and approximation functions. And derive Projection Transformations.
	CO5	Detect visible surfaces using various routines, thus hiding back faces in 3D graphics, and generate Computer Animation.
Microprocessors and Micro Controllers	CO1	Summarize the architectural features of 8086 microprocessor.
	CO2	Write assembly language programs and can handle DOS/BIOS routines and interrupt structures.
	CO3	Choose the appropriate operating modes of 80386 to relate with the application.
	CO4	Interface varies peripherals with 8086 microprocessor.
	CO5	Summarize the architectural features of 8051, PIC controller.
Compiler Design Lab	CO1	Understand and apply the knowledge of lex tool & YACC tool to develop a scanner & parser.
	CO2	Design & conduct experiments for Intermediate Code Generation in compiler.
	CO3	Analyze and translate the knowledge of patterns, tokens & regular expressions for solving problems.

	CO4	Identify the new code optimization techniques to improve the performance of a program in terms of speed & space.
	CO5	Apply the new tools and technologies used for designing a compiler.
	CO6	Develop program to solve complex problems in compiler
Operating Systems Lab	CO1	To use of an operating system to develop software.
	CO2	To write software systems based on multiple cooperating processes or threads.
	CO3	To implement file organization techniques.
	CO4	To implement file allocation strategies.
	CO5	To implement process scheduling & synchronization algorithms.
	CO6	To implement memory management scheme like best fit, worse fit etc.
Microprocessors and Microcontrollers Lab	CO1	The students will be equipped with the basic knowledge of microprocessor and microcontroller interfacing and their applications.
Computer Networks	CO1	Identify and enumerate different types of network topologies, protocols and the layers of the OSI and TCP/IP models and explain the functions of each layer.
	CO2	Explain the protocols of Data Link Layer and MAC Sublayer and illustrate how a network can detect and correct transmission errors.
	CO3	Classify and compare the major routing and congestion control algorithms and understand how a packet is routed over the internet.
	CO4	Describe how TCP and UDP function, its uses and summarize the differences between them.
	CO5	Analyze the features and operations of various Application layer protocols such as http, DNS, and SMTP.
Object Oriented Analysis & Design	CO1	Explain fundamental concepts of object-oriented analysis and design approach.
	CO2	Describe Unified Modeling Language Notation and models for object-oriented system development
	CO3	Create use case diagram to represent the scope of development problem domain.
	CO4	Develop domain model, sequence diagram, activity diagram and state chart diagram based on use case narrative.
	CO5	Build up experience on adopting object-oriented approach as an alternative methodology for system development.
Design and Analysis of Algorithms	CO1	Measure the performance and calculate the Time & Space complexities of algorithms.
	CO2	Design effective algorithms based on Divide and Conquer and Greedy methods.
	CO3	Discuss various problems suitable to Dynamic programming.
	CO4	Construct a state space tree to solve different problems using Backtracking technique.
	CO5	Find an optimal solution by applying different Branch and Bound techniques and illustrate Non-deterministic algorithms.

Data Warehousing & Data Mining	CO1	Recognize types of Data, Data Quality, need of preprocessing and different measures of similarity and dissimilarity.
	CO2	Differentiate between methods for modeling multidimensional data, design and implement Data Warehouse.
	CO3	Explain in detail major techniques and algorithms involved in data mining, including techniques and algorithms for data preprocessing, association rule mining, data classification, and data clustering.
	CO4	Evaluate the performance of a classifier.
	CO5	Compare and contrast Partitioning, Hierarchical and Density based Clustering Algorithms.
Web Technologies	CO1	Understand and build Web pages using HTML
	CO2	Apply styles to web pages and validate the forms using JavaScript
	CO3	Design and Develop a parser that retrieve data from XML Files.
	CO4	Apply their computer science skills to the create a website with some understanding of the legal, security, commercial, marketing and other issues involved.
	CO5	Understand ways of using different web technologies
ii) Image Processing	CO1	Explain Basic Concepts in Image Processing and various color models
	CO2	Apply Spatial Domain Techniques for Image Enhancement
	CO3	List the Image Compression Techniques
	CO4	Discuss Various Morphological Algorithms
	CO5	Classify Various Image Segmentation Techniques
Web Technologies Lab	CO1	Understand and build a complete website using HTML ,
	CO2	Apply CSS and JavaScript for creation and validation of developing web pages.
	CO3	Design and Develop applications to store and retrieve data from XML files.
	CO4	Implement a dynamic website by using the Servlets and JSP
	CO5	Design and develop database applications
	CO6	Apply a database and associate it with a website.
Computer Networks & Case Tools Lab	CO1	At the end of the course a student will:
	CO2	Ability to apply knowledge of mathematics, probability, and statistics to model and
	CO3	analyze some networking protocols.
	CO4	Ability to design, implement, and analyze simple computer networks.
	CO5	Ability to use techniques, skills, and modern networking tools necessary for engineering practice.
Unix Programming	CO1	Work confidently on writing shell scripts by using shell environment.
	CO2	Tell the difference between conventional function calls versus system calls in UNIX and Classify system calls in UNIX
	CO3	Describe the relation of a concept of a process and handle a process by using signals.

	CO4	Define mechanisms for local and remote inter-process communication in UNIX and implement the client-server paradigm of computing with mechanisms of IPC.
	CO5	Identify the System calls for synchronization, protection, and interrupts of any UNIX.
Network Security & Cryptography	CO1	Recall different Security Attacks, Services and Mechanisms.
	CO2	Classify and explain categories of different encryption and decryption techniques.
	CO3	Identify the authentication applications such as Kerberos and x.509 directory services. and Analyze the usage of PGP and S/MIME.
	CO4	Familiar with the importance of IP Security and Web Security.
	CO5	Exposed to viruses and related threats and design principles of firewalls
Mobile Computing	CO1	Discover the characteristics of in mobile communications including the major network components and architectures of the networks systems
	CO2	Analyze the calling system of mobile computing systems
	CO3	Explore the characteristics of different types of MAC on the performance of a mobile computing system
	CO4	Analyze and compare the performance of different MANET routing algorithms for mobile real-time applications
	CO5	Develop an attitude to propose solutions with comparisons for problems related to Mobile computing system through investigation
	CO6	Categorize mobile wireless short range networks and mobile internet for which support quality of service for secure data transfer.
iv) Advanced Computer Networks	CO1	Identify the Internet and their use of protocols.
	CO2	Create design of outlining OSI model, TCP/IP model.
	CO3	Describe the major documents for different types of routing algorithms.
	CO4	Produce and present documents for different types of switching models.
	CO5	Determine and apply the appropriate statistical procedures to analyze Dynamic Host Configuration Protocol.
	CO6	Produce a strategic plan for MANET.
ii) Cyber laws	CO1	Understand about security policies, latest crimes and different offences.
	CO2	Analyze the activities of fraud prevention, monitoring, investigation and report.
	CO3	Differentiate among the models, architectures, challenges and global legal constraints of secure electronic commerce technologies.
	CO4	Have knowledge of cyber law and ethics
	CO5	Evaluate the interaction and relative impact of human factors, processes and technology in cyber law infrastructure.

Mobile Application Development Lab	CO1	Design and implement the user interfaces of mobile applications
	CO2	Evaluate and contrast requirements for mobile platforms to establish appropriate strategies for development and deployment.
	CO3	Understanding and apply the key technological principles and methods for delivering and maintaining mobile application
	CO4	Design mobile application that demonstrate different layout designs in android application
	CO5	Apply Java programming concepts to Android application development.
Unix Programming Lab	CO1	Remember how Unix File Structure is organized, familiarize with UNIX commands, and implement shell scripts.
	CO2	Classify system calls in UNIX
	CO3	Analyze the concepts of process, threads, and file structure.
	CO4	Implement IPC using pipes, semaphores, Shared Memory and messages.
	CO5	Create Client / Server applications using sockets
Software Project Management	CO1	Use techniques to reduce project costs and improve ROI.
	CO2	Understand reasons for software failures and identify improvements.
	CO3	Plan and Implement iterative software development phases.
	CO4	Ability to create and maintain project artifacts for better stakeholder communication.
	CO5	Ability to assess progress and manage a project.
i) Cloud computing	CO1	Articulate the basic concepts, key technologies, strengths,and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
	CO2	Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
	CO3	Identify the Collaborations of Cloud and evaluate webmail services .
	CO4	provide the appropriate cloud computing solutions and recommendations according to the applications used.
	CO5	Attempt to generate new ideas and innovations based on Virtualization in cloud computing and Provide Security for cloud applications
iii)Machine Learning	CO1	Identify the applications of Machine learning and able to state the developing of Learning System.
	CO2	Classify Decision Tree Learning Algorithms for learning of appropriate problems.
	CO3	Use Learning Algorithms to classify text by applying various Classification Algorithms.
	CO4	Formulate Computational Learning Theory for Finite and Infinite hypothesis spaces.
	CO5	Generate Rule Sets and setup First Order Rules.

DEPARTMENT OF ECE - A.Y: 2017-18

Program Outcomes	
PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	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.
PO3	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.
PO4	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.
PO5	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.
PO6	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.
PO7	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.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.

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PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes

PSO1	The Competency in the application of circuit analysis and design.
PSO2	The ability to solve Electronics and Communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.
PSO3	The ability to pursue higher studies in either India or abroad and also lead a successful career with professional ethics.

COURSE OUTCOMES

Course Title		Description of the Course Outcome
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	CO2	interpret the content of a passage and state their perspective.
	CO3	understand words and their meanings, and know prefixes, suffixes, analogies, synonyms, antonyms and one word substitutes.
	CO4	use articles, quantifiers, gerunds, infinitives, present participles and tenses appropriately.
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	CO2	Identify and solve a 2nd and higher order differential equations and perform simple applications in Engineering.
	CO3	Estimate the maxima and minima of two variable functions under different constraints.
	CO4	Solve a multiple integral and apply to estimate the volume and surface area of the solids
	CO5	Calculate grad, divergence, curl; a line, surface and volume integral. To find work done, area, and volume. Apply the vector integral theorems to evaluate multiple integrals.
Environmental Studies	CO1	Recognize the general issues of environment and know how to conserve the environment, speaks well again on various resources, present status and their better usage.
	CO2	Explain the interdependency of life in the ecosystem, demonstrate the structural and functional setup, classify and appraise the importance of diversity on the earth and differentiate the conservation methods.
	CO3	Examine the various types of pollutants and their impacts along with their control methods; review the different types of solid wastes, impacts and their eco-friendly disposal methods.

	CO4	Translate the concept of sustainable development by green technologies, experiment on the environmental management systems for clean, green, safe and healthy environment through clean development mechanisms.
	CO5	Evaluate the changing trends of population curves among different nations, discuss how to limit the current population size, collect and compile the information to document the environmental assets.
Engineering Physics	CO1	Apply the principles of optics in designing optical devices
	CO2	outline the Principles of Lasers and Fiber Optics
	CO3	resolve the discrepancies in classical estimates through quantum principles
	CO4	Interpret the knowledge of Magnetic Properties in Material Fabrication
	CO5	explain the response of E-Field on Dielectric Materials to control the device performance
Network Analysis	CO1	Apply the basic circuit analysis techniques, power terminology in AC circuits and application of these concepts in analyzing complex DC and AC circuits
	CO2	Discuss and apply the basic electrical laws.
	CO3	Analyze steady state analysis of AC circuits
	CO4	Compute the AC and DC circuits with theorems
	CO5	Illustrate DC transients and two port networks
Engineering Mechanics	CO1	Know the system of forces and calculate the resultant of different force system
	CO2	Draw the free body diagram and understand the concept of moment and couple
	CO3	Know the friction between two mating surfaces and calculate cetroid of plane areas
	CO4	Determine area and mass moment of inertia for different sections
	CO5	Determine the kinematic relations of particles & rigid bodies.
Engineering Physics Lab	CO1	Infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
	CO2	Apply classic experimental techniques to comprehend the Phenomenon of resonance with equipment such as sonometer, Melde’s apparatus and volume resonator to measure desired properties
	CO3	Demonstrate the ability to measure properties of optical systems and design instrumentation with precision measurements to estimate error for targeted accuracy
	CO4	Illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
	CO5	Evaluate characteristics of magnetic, dielectric and semiconducting material devices
Basic English Communication Skills Lab	CO1	pronounce words accurately based on the knowledge of speech sounds and use appropriate intonation patterns in speech

	CO2	comprehend audio and video clips of different accents
	CO3	describe / discuss / explain a given situation / context well
	CO4	read and recall what they have read
	CO5	understand and interpret information provided in graphs, tables etc.
Information Technology Work Shop Lab	CO1	Gain knowledge on computer system such as system unit, input devices, output devices connected to the computer
	CO2	Understand the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use.
	CO3	Gain knowledge to understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc.
	CO4	Get familiarize with parts of Word window, To create and save a document, To set page settings, create headers and footers, To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.
	CO5	Get familiarize with parts of Excel window, To create and save a workbook with single and/or multiple worksheets, To apply operations on range of cells using built-in formulae, etc.
English Communication Practice	CO1	use grammar appropriately in speech and writing
	CO2	describe, discuss, explain and interpret a given situation/ context effectively.
	CO3	read texts and listen to lectures and make notes on them
	CO4	apply reading techniques in their other subjects
	CO5	summarize, paraphrase and review a piece of writing efficiently
Engineering Mathematics - II	CO1	Solve the algebraic and transcendental equations by identifying suitable numerical methods, estimate a linear and non-linear curve to the given data by the method of least squares, calculate the value of dependent variable for a particular x by deducing the unknown function $y = f(x)$ for an evenly or unevenly spaced points
	CO2	Estimate the value of derivatives, evaluate the definite integrals using different numerical methods and evaluate an IVP.
	CO3	Deduce Laplace transform of different continuous functions using different properties and solve an I.V.P & B.V.P applying Laplace transform
	CO4	Deduce the Fourier series and half range series expansions of different functions for different intervals
	CO5	Solve a linear and non-linear 1st order partial differential equation and using method of separation of variables evaluate a wave equation & heat equation
Engineering Chemistry	CO1	Differentiate different molding techniques of plastic material
	CO2	Determine total hardness of water by EDTA method
	CO3	Design the metallic materials to prevent corrosion
	CO4	Apply suitable lubrication mechanisms for various machinery parts

	CO5	Demonstrate the working of Photovoltaic cell
Engineering Drawing	CO1	Construct Polygons, Ellipse And Scales(Plain, Diagonal,Vernier)
	CO2	Draw Orthographic Projection Of Points And Straight Lines In Any Quadrant and determine Its True Length And True Inclination
	CO3	Draw projections of plane surfaces inclined to either one or both reference planes
	CO4	Draw Projections Of Simple Solids Inclined To One Reference Plane
	CO5	Convert orthographic views into isometric projections and vice versa
Electronic Devices	CO1	Describe the behavior of electron in electric and magnetic fields
	CO2	Summarize the characteristics of semiconductor materials
	CO3	Distinguish the semiconductor diodes according to working principles and applications and to demonstrate the use of semiconductor diode as a rectifier
	CO4	Point out the working and behavior of transistor (BJT & FET) in different configurations
	CO5	Explain the working and applications of SCR, UJT and MOSFETs
Computer Programming	CO1	Understand the fundamentals of C programming
	CO2	Choose the loops and decision making statements to solve the problem
	CO3	Implement different operations on arrays and solve problems using functions
	CO4	Understand pointers, structures and unions
	CO5	Implement file operations in C programming for a given application
Engineering Chemistry Lab	CO1	Determine Dissolved Oxygen. and Turbidity of water samples
	CO2	Explain the importance of viscosity, Flash point and Acid value of a lubricant
	CO3	Determine the amount of acid or base by pH metric and conductometric titrations
	CO4	Determine the hardness of various water samples
	CO5	Operate all the instruments in the chemistry laboratory analysis
Electronic Devices Lab	CO1	Determine the voltage, current and frequency using CRO
	CO2	Draw the characteristics of PN Diode and Zener Diode
	CO3	Explain the characteristics of transistor in CB, CE and CC configurations
	CO4	Compute the V-I characteristics of JFET
Computer Programming Lab	CO1	Recall and implement different basic concepts like data types, input/ output and decision making statements
	CO2	Describes and implement usage of loop control and array operations.
	CO3	Apply knowledge to implement functions and their usage.
	CO4	Analyze the representation of memory using pointers and dynamic memory allocation.
	CO5	Familiar with the importance and implementation of structures and unions
	CO6	Exposed to implement file handling concepts

Signals & Systems	CO1	Classify various types of signals and systems
	CO2	Compute the Fourier series and Fourier transform of a set of well-defined continuous time signals
	CO3	Analyze the characteristics of Linear Time Invariant systems
	CO4	Explain the need of sampling, convolution and correlation concepts
	CO5	Summarize the concepts of Laplace and Z transforms
Pulse & Digital Circuits	CO1	Construct different linear networks like low pass and high pass circuits and determine their response to different signals
	CO2	Determine the transfer characteristics of clippers and clamper circuits
	CO3	Determine the switching characteristics of semiconductor devices and analysis of binary
	CO4	Design of multivibrators and analysis of time base generators
	CO5	Analysis of blocking oscillators and sampling gates
Electronic Circuits-I	CO1	Recognize functionalities of diode, inductor and capacitor in rectifiers, filters and regulators
	CO2	Estimate operating point of BJT & FET for different regions with stable conditions
	CO3	Analyze the simplified h-parameter equations for BJT use an amplifier and also the fundamentals of miller theorem
	CO4	Operate BJT & FET on Small signal model.
	CO5	Describe different types of feedback amplifiers
Linear Control Systems	CO1	Estimate basic components of feedback control systems; formulate mathematical model of physical systems and represent them in block diagrams and signal flow graphs.
	CO2	Discuss the time-domain specifications; Analyze first and second order control systems in time domain
	CO3	Analyze stability of the system from transfer functions approach and graphical methods.
	CO4	Design controllers, compensators and control system
	CO5	Solve physical systems in state space form
Electrical Technology	CO1	Discuss the operation and performance of DC machines
	CO2	Summarize the performance of transformers
	CO3	Discuss the operation and performance of induction motors
	CO4	Generalize the working principle and types of alternators
	CO5	Describe the working principle of measuring instruments
Electronic Circuits – I Lab	CO1	Construct the rectifiers with filters and without filters
	CO2	Obtain the Bandwidth of common emitter amplifier
	CO3	Calculate the Gain, Input and Output resistances of common collector amplifier
	CO4	Apply the concept of feedback to analyze feedback amplifiers
Pulse & Digital Circuits Lab	CO1	Design linear and non linear wave shaping circuits
	CO2	Demonstrate the operation of logic gates and sampling gates
	CO3	Analyze multivibrators and its applications
	CO4	Generate Oscillations and sweep signals using UJT and Boot strap circuits

	CO5	Test and explain the operation of Transistor as a switch
Networks and Electrical Technology Lab	CO1	Demonstrate different theorems for electrical circuits
	CO2	Estimate the bandwidth and Q factor of series and parallel circuits
	CO3	Analyze steady state analysis of A.C. circuits and two port networks
	CO4	Determine performance of D.C. machines
	CO5	Interpret performance of A.C. machines.
Professional Ethics and Morals	CO1	Realize the importance of human values
	CO2	Understand that excessive desires of the mind make a person unethical and restless, while fewer desires lead to peace and professional progress
	CO3	Assess different types of risks involved in unethical practices. Know various means of protesting against unethical practices
	CO4	Assess the benefits of restraining from unethical practices like bribery, extortion,nepotism, nexus between politicians and industrialists
	CO5	Summarize case studies of ethical violations in Chernobyl meltdown, Challenger disaster, Ford Pinto design, King fisher Airlines financial misappropriation
Matrices and Applications	CO1	Calculate the rank of a matrix and solve linear system of equations by different methods
	CO2	Calculate Eigen values, eigen vectors of real and complex matrices, apply Cayley's Hamilton theorem to calculate the powers and inverse of matrices
	CO3	Solve linear system of equations by LU –Factorization, Matrix Inverse, Gauss seidal Method, Eigen Values by Iteration (Power Method), Tridiagonalization and QR-Factorization
	CO4	Deduce quadratic to canonical form by different methods
	CO5	Compute matrix operations using MATLAB
Introduction to MATLAB	CO1	Translate mathematical methods to MATLAB code
	CO2	Generalize results and represent data visually
	CO3	Apply computer methods for solving a wide range of engineering problems
	CO4	Utilize computer skills to enhance learning and performance in other engineering and science courses
	CO5	Demonstrate professionalism in interactions with industry
Fundamentals of Material Science	CO1	Gain thorough knowledge in engineering materials and their structures
UNIX Utilities	CO1	Identify and use UNIX utilities to create and manage simple file processing operations, organize directory structures with appropriate security
	CO2	Effectively use the UNIX system to accomplish typical personal, office, technical, and software development tasks
	CO3	Monitor system performance and network activities

	CO4	Effectively use software development tools including libraries, pre-processors, compilers, linkers, and make files
	CO5	Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines
	CO6	Develop shell scripts to perform more complex tasks
IT systems Management	CO1	Describe the business value and processes of ICT services in an organisation and apply that knowledge and skill with initiative to a workplace scenario
	CO2	Analyze and evaluate the impact of new and current ICT services to an organisation
	CO3	Describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organisation
	CO4	Characteristics of the network that affect user satisfaction
	CO5	Define, track, and maintain data and data resources
Fundamentals of Strength of materials	CO1	understand the elasticity and plasticity, types of stresses and strains, Hooke's law,working stress, factor of safety, lateral strain, poisson's ratio and volumetric strain
	CO2	understand the relationships between stress-strains of ductile and brittle materials, Elastic moduli
	CO3	learn about the beams and its supports, types, concept of S.F and B.M
	CO4	learn about S.F.D and B.M.D of Cantilevers
	CO5	understand S.F.D and B.M.D of Simply Supported beams
Analog Communications	CO1	Explain the basic elements of communication system, need for modulation and elaborately about amplitude modulation.
	CO2	Describe the time and frequency domain representation, generation and demodulation of DSBSC, SSB and VSB modulation schemes.
	CO3	Discuss the concepts of angle modulation.
	CO4	Explain various issues in radio transmitters and receivers
	CO5	Describe pulse modulation schemes and estimate the noise in analog modulation schemes
Electro Magnetic Field Theory & Transmission Lines	CO1	Apply differential equations, vector algebra, integral multivariate calculus and complex calculus to solve for basic electrostatic, magneto static and electromagnetic field problems.
	CO2	Analyze the interaction of electromagnetic fields in different media.
	CO3	Describe electromagnetic fields using Maxwell's relations.
	CO4	Solve the reflection and transmission of uniform plane waves at planar interfaces.
	CO5	Learn about Transmission line theory.
Electronic Circuits-II	CO1	Examine the application of positive feedback as an oscillator
	CO2	Extrapolate BJT and FET amplifier used for cascading stages.
	CO3	Analyze BJT at high frequency model
	CO4	Differentiate BJT and FET amplifier as a power amplifier for high voltage applications.
	CO5	Interpret the concepts of tuned amplifiers and regulators.

Digital Electronics	CO1	Classify different number systems and apply to generate various codes.
	CO2	Use the concept of Boolean algebra in minimization of switching functions
	CO3	Design different types of Adders and Subtractors
	CO4	Design different types of decoders, encoders, code converters, multiplexers and comparators
	CO5	Apply knowledge of flip-flops in designing of Registers and Counters
Random variables & Stochastic Processes	CO1	Recall the mathematical concepts related to probability theory.
	CO2	Understand random variable and distribution functions
	CO3	Translate one random variable to multiple random variables.
	CO4	Understand random process and its temporal characteristics.
	CO5	Discriminate the power spectrum estimation in time and frequency
Analog communications Lab	CO1	Integrate and test AM and FM modulators and demodulators
	CO2	Illustrate sampling theorem in different conditions
	CO3	Analyze AM and FM signals using Spectrum analyzer
	CO4	Test associated circuits such as AGC, pre-emphasis and de-emphasis
	CO5	Integrate and test various pulse modulation and demodulation schemes
	CO6	Estimate lock range and capture range of PLL
Digital Electronics Lab	CO1	Distinguish logic gates for design of digital circuits
	CO2	Design different types of Combinational logic circuits
	CO3	Analyze the operation of flip-flops
	CO4	Apply knowledge of flip-flops in designing of Registers and Counters
Electronic Circuits – II Lab	CO1	Construct the RC phase shift oscillator using transistors for different frequencies
	CO2	Design Wien Bridge oscillator using transistors for different frequencies
	CO3	Estimate frequency response of two stage RC coupled amplifier
	CO4	Calculate the resonant frequency of single tuned amplifier
	CO5	Draw the characteristics of series and shunt voltage regulators
Renewable Energy Sources	CO1	Define different kinds of solar radiation.
	CO2	Utilize different methods of collection of solar energy and storage of solar energy.
	CO3	Classify different types of wind mills and biogas digesters.
	CO4	Classify different types of geothermal energy sources and utilize different types of extracting techniques.
	CO5	Distinguish different kinds of direct energy conversion techniques.
Principles of Mechanical Measurements	CO1	Define basic principles of measurement systems, and describe dynamic performance characteristics and sources of error.
	CO2	Measure pressure and flow using appropriate instruments

	CO3	Measure temperature using different transducers.
	CO4	Measure Displacement and Acceleration using appropriate devices.
	CO5	Measure force, torque speed and power using suitable instruments
Introduction to Java	CO1	Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
	CO2	Identify classes, objects, members of a class and the relationships among them needed for a specific problem
	CO3	To demonstrate the ability to understand and use Exception handling and file handling mechanism
	CO4	Arrange the concrete and abstract classes in an appropriate hierarchy.
	CO5	Develop efficient Java applets and applications using OOP concept
Introduction to PYTHON	CO1	Be fluent in the use of procedural statements — assignments, conditional statements, loops, method calls — and arrays.
	CO2	Identify or characterize or define a problem.
	CO3	Design, code, and test small Python programs that meet requirements expressed in English. This includes a basic understanding of top-down design.
	CO4	Understand the concepts of object-oriented programming as used in Python: classes, subclasses, properties, inheritance, and overriding.
Complex Variables	CO1	Analyze whether a function is analytic or not, check for a harmonic function and find a harmonic conjugate via the Cauchy-Riemann equations.
	CO2	Evaluate complex integrals using the Cauchy Integral Theorem and formulae.
	CO3	Identify, classify, zeros and singular points of functions, and find Laurent series expansion of complex functions for different region of convergence.
	CO4	Calculate the residues by Laurent Series, residue theorem.
	CO5	Apply residue theorem to evaluate various contour integrals.
Remote sensing	CO1	Understand the basic components of remote sensing, electromagnetic radiation, electromagnetic spectrum
	CO2	Understand about the sensors and their types
	CO3	Learn about platforms
	CO4	Learn about the image analysis
	CO5	Understand the image classification
Linear IC Applications	CO1	Analyze differential amplifiers based on voltage gain, input resistance and output resistance
	CO2	Determine the characteristics and various parameters of op-amp
	CO3	Design the circuits using op-amps for various applications.
	CO4	Design Active filters and Summarize the Performance of the ADC and DAC
	CO5	Describe Linear ICs like 555 Timer,IC-566, PLL, analog multipliers and modulators.
Digital IC Applications	CO1	Identify and distinguish the behaviour of various logic families
	CO2	Design and Analyse the different combinational circuits with relevant IC’s for various applications.

	CO3	Design and Analyse the different sequential circuits with relevant ICs for various applications
	CO4	Design programmable logic devices with relevant digital ICs
	CO5	Classify the various memory devices with their internal structures and timing
Digital communications	CO1	Differentiate various digitization techniques to achieve minimum bandwidth requirement.
	CO2	Summarize and analyze all digital modulation techniques and probability of error calculations.
	CO3	Measure the digital information through mathematical modeling and utilize suitable source coding techniques based on requirements in digital system.
	CO4	Learn various block codes encoding and decoding methods.
	CO5	Design convolution code encoder and decoder and to know graphical approach.
Antennas and Wave Propagation	CO1	Describe the basic parameters of antenna and use solutions of Maxwell's equations to calculate electromagnetic field component for liner antennas.
	CO2	Illustrate the concepts of different antenna arrays and their characteristics.
	CO3	Design the different types of antennas at LF, HF and VHF frequencies.
	CO4	Design and analyze the different types of antennas at UHF and MW frequencies.
	CO5	Identify the atmosphere and terrestrial effects on Radio Wave Propagation.
Electronic Measurements and Instrumentation	CO1	CO1: Identify electronic instruments, their Characteristics and use, peculiar errors associated with the instruments and how to minimize such errors.
	CO2	Describe various signal generators, wave analyzers for distortion measurements.
	CO3	Measure Amplitude, Frequency and Phase of various signals using different types of CRO's.
	CO4	Design the AC bridges for measurement of resistance, inductance, capacitance for Frequency changes and Q-meter applications.
	CO5	Explain various types of transducers and their applications for measuring non- electrical parameters.
Computer Organization & Architecture	CO1	Knowledge of basic structure of a digital computer and data representation.
	CO2	Implementation of different arithmetic operation in binary, decimal number system and floating point representation.
	CO3	Knowledge of instruction set, addressing mode, instruction format, processor organization, micro operation and arithmetic logic unit design.
	CO4	Ability to understand different type of memory unit, input unit, output unit and knowledge

	CO5	Distinguish parallel processing and multiprocessor in computer system and knowledge of
Digital Communications lab	CO1	Describe the process of Time division Multiplexing.
	CO2	Illustrate digital output by different digitization methods and to reproduce actual analog signal.
	CO3	Draw plots of the Digital Modulation and Demodulation waveforms (ASK, FSK, PSK and DPSK).
	CO4	Verify companding and source encoding techniques
	CO5	Verify Linear Block Codes implementation..
	CO6	Predict the outputs of Non Linear Block Codes (Convolution Code).
IC Applications Lab	CO1	Identify specifications and parameters of IC 741, IC 555, IC 565, IC 566, IC 1496 and design Op-amp circuits to verify various mathematical operations.
	CO2	Calculate Cut-off frequencies of Active Filters using Op-amp.
	CO3	Generate sine wave, Pulse wave and Square wave using op-amp and Timer circuits.
	CO4	Convert Digital input into Analog output using Op-amp.
	CO5	Produce constant and variable voltages using Regulators
I P R & Patents	CO1	Understand the scope of intellectual property rights.
	CO2	Understand the reasons behind the existence of intellectual property law.
	CO3	Understand the process of the historical development of intellectual property rights.
	CO4	Understand the distinct contribution of intellectual property law to the protection of human creativity, innovation, and effort.
Managerial Economics& Management Science	CO1	Recognize managerial economics skills to the solution of engineering problems.
	CO2	Explain the cost and production theories in engineering problems.
	CO3	Explore and develop the management qualities.
	CO4	Enhance the problem solving skills in various business areas.
	CO5	Evaluate the future threats and application theories.
Microprocessors and Microcontrollers	CO1	Summarize the architectural features of 8086 microprocessor.
	CO2	Write assembly language programs and can handle DOS/BIOS routines and interrupt structures.
	CO3	Choose the appropriate operating modes of 80386 to relate with the application.
	CO4	Interface varies peripherals with 8086 microprocessor.
	CO5	Summarize the architectural features of 8051, PIC controller.
Digital Signal Processing	CO1	Discriminate the discrete systems based on their basic properties
	CO2	Determine the frequency response of different signals using DFT and FFT

	CO3	Design FIR and IIR filters using different techniques
	CO4	Use up and down sampling of signals in multirate signal processing
	CO5	Identify the architecture of DSP processor and understand the function of each element
VLSI Design	CO1	Identify different MOS technologies for VLSI design
	CO2	Distinguish characteristics of CMOS and BICMOS
	CO3	Draw the stick &layout diagrams of various circuits
	CO4	Calculate delays and scaling parameters of MOS circuits
	CO5	esign and test CMOS circuits.
TV & Satellite Communications	CO1	Learn the working principles of television transmitter, receiver, image continuity, scanning, TV signal modulation, transmission & propagation.
	CO2	Familiarize with monochrome and colour camera tubes, picture tubes, colour signal generation and different Television standards
	CO3	know the working of Monochrome and colour TV receiver and their subsystems.
	CO4	learn the basics of Satellite communications, Orbital mechanics and launchers.
	CO5	Describe satellite subsystems, satellite orbits, LEO and Geo Stationary systems
Bio-medical Signal processing	CO1	Describe different data compression techniques for processing of ECG signals
	CO2	Discuss the cardio-vascular system, ECG pattern recognition and heart rate variability analysis.
	CO3	Discuss briefly about EEG signals based on stage analysis, inverse filtering of EEG signals
	CO4	Distinguish different adaptive algorithms to enhance the ECG and EEG signals
	CO5	Discuss about different signal averaging methods.
Analog IC design	CO1	Explain the techniques of design and layout of analog circuits using CMOS.
	CO2	Know the concepts of circuit design problems in real time applications.
	CO3	Know Design and analysis of PLL circuits.
	CO4	Summarize switched capacitor circuits and comparators.
	CO5	Distinguish different A/D &D/A converters.
Transform Techniques	CO1	Explain different 2D transforms.
	CO2	Compute time frequency and multi-resolution analysis of different transforms.
	CO3	Distinguish the importance of continuous and discrete wavelet transforms.
	CO4	Explain construction of perfect filter banks.
	CO5	Apply wavelet transform methods to signal and image processing applications.
OOPS through Java	CO1	Become familiar with the fundamentals and acquire programming skills in java language.

	CO2	Understand the fundamentals of object oriented programming in java, including defining classes, objects, invoking methods using class libraries etc.
	CO3	Able to understand and apply various object oriented feature like inheritance, polymorphism to solve various computing problems and take the statement of a business problem and form this determine suitable logic for solving problem.
	CO4	Identify java's standard packages and different levels of member access and how they relate to packages and implement error handling techniques using exception handling.
	CO5	Able to explore common issues encountered when creating a cross platform multi threaded application and also develop efficient java applets.
Microprocessor and Microcontroller Lab	CO1	Write assembly language programs using arithmetic instructions.
	CO2	Write assembly language programs using logical instructions.
	CO3	Write assembly language programs using string instructions.
	CO4	Write 8086 interfacing programs by using 8255 and 8279.
	CO5	Write assembly language programs on 8051 micro controller
Digital Signal Processing Lab	CO1	Compute linear convolution and circular convolution
	CO2	Design IIR and FIR filters with relevant techniques
	CO3	Calculate DFT by using FFT algorithms
	CO4	Write MATLAB programs for various signal processing techniques.
	CO5	Summarize DSP processor TMS320C5X/6X
HDL Programming Lab	CO1	Apply switching theory to verify truth tables of gates
	CO2	Summarize the logical properties of combinational logic circuits
	CO3	Analyze the logical properties of flip flops in designing of counters and registers
	CO4	Test the read/write operations of RAM
	CO5	Write & implement VHDL programs of combinational & sequential circuits
Digital Image Processing	CO1	Describe how images are formed, sampled, quantized, represented digitally and explain transform-domain representation of images
	CO2	apply the image transforms in image compression, watermarking etc,.
	CO3	Apply the image intensity transformations and filtering for the purpose of image enhancement in the spatial and frequency domains.
	CO4	Interpret image restoration in the spatial and frequency domains, summarize color models and processing color images.
	CO5	Distinguish compression algorithms and apply different types of edge detection and segmentation algorithms
Radar Engineering	CO1	Assess the concepts of different Radar constants, frequencies and simple range Equation and analyze the operation of simple Radar.
	CO2	Differenti ate between basic principles of CW radar and Frequency modulated radars.

	CO3	Distinguish between different types of MTI radars and its principles.
	CO4	Distinguish between different types of tracking radars and its principles.
	CO5	Synthesize the detection of radar signals in noise and Analyze different displays.
Microwave Engineering	CO1	Apply the E M theory for calculation of various parameters related to waveguides and Cavity resonators.
	CO2	Integrate a wide range of microwave components for various applications.
	CO3	Analyze the difference between the conventional tubes and the microwave tubes for the transmission of the EM waves.
	CO4	Comprehend the design aspects of O-type tubes and its characteristics.
	CO5	Analyze basic principles and operation of microwave solid state devices,Perform various measurements using microwave equipment.
Telecommunication Switching Systems and Networks	CO1	Comprehend the evolution of telecommunications and switching systems.
	CO2	Classify different types of switching techniques.
	CO3	Describe the concepts of telephone networks and compare signalling techniques.
	CO4	Illustrate the OSI reference model and various types of networks.
	CO5	Differentiate various switching networks in Data communication.
	CO6	Categorize the applications of Integrated Services Digital Networks (ISDN).
Wireless Communication Networks	CO1	Describe various multiple access techniques
	CO2	Explain Bluetooth and wireless data services.
	CO3	Explain the operation of Mobile IP and WAP
	CO4	Describe IEEE 802and mobile data networks
	CO5	Describe wireless ATM and HIPERLAN.
Speech Processing	CO1	Get familiar with basic characteristics of speech signal in relation to production and hearing of speech by humans.
	CO2	Understand basic algorithms of speech analysis common to many applications.
	CO3	Give an overview of applications (recognition, synthesis, coding) and be informed about practical aspects of speech algorithms implementation.
	CO4	Design filter to remove unwanted noise from the speech
	CO5	To know speech recognition using simple ANN models
Digital IC Design	CO1	Understand the concepts of MOS Transistor and the CMOS Inverter.
	CO2	Understand the concepts and designing of digital building blocks like combinational Logic circuits, sequential logic circuits using VHDL.
	CO3	Understand the design of building blocks of digital ICs using various modeling techniques.

	CO4	Analyze modes of operation of MOS transistor and its basic electrical properties
	CO5	Calculate the parasitic resistance and capacitance produced by the layouts and thus designing circuits with better performance Design various combinational circuits using gates and transistors for RAM and ROM
Artificial Neural Networks	CO1	Learn the basics of biological Neural Network.
	CO2	Know the basics of artificial Neural Network.
	CO3	Learn the architecture of Feed forward network.
	CO4	Explain various applications of ANN
	CO5	Describe different pattern recognition task using ANN.
Data Base Management systems	CO1	Differentiate Database systems from file systems and define the terminology, features, classifications, Characteristics embodied in database systems.
	CO2	Interpret Design and Implement and E-R Model.
	CO3	Create / Modify the Structure and write optimized SQL Queries to extract and modify Information from tables or view.
	CO4	Apply proper techniques such as normalization and analyze the applicability of a Specific normal form in designing a database.
	CO5	Compare various indexing, Hashing and file organization techniques.
	CO6	Explain broad range of database Management issues including Data integrity, concurrency recovery and security.
Air Quality Management	CO1	Solve air pollution problems of industries.
	CO2	Create awareness among the public on the effects of air pollution at local level as well as global level.
	CO3	Manage the ambient air quality by maintaining emission standards.
	CO4	Gets successful employment in organizations working for the protection of environmental.
	CO5	Design air pollution control equipments for industries and other polluting sources.
Cyber Laws	CO1	Have comprehensive information about security policies, establishing necessary organizational processes /functions for information security and will be able to arrange necessary resources.
	CO2	Understand, analyze and work on activities of fraud prevention, monitoring, investigation, reporting.
	CO3	Differentiate among the models, architectures, challenges and global legal constraints of secure electronic commerce technologies used to ensure transmission, processing and storage of sensitive information.
	CO4	Have knowledge of cyber law and ethics.
	CO5	Evaluate the interaction and relative impact of human factors, processes and Technology in cyber law infrastructures.
Entrepreneurial Development	CO1	Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
	CO2	Understanding Entrepreneurship Development programmes in INDIA and contents for training for Entrepreneurial competencies.

	CO3	Create appropriate business model and develop well presented business plan that is feasible for the student.
	CO4	Understanding how to manage effectively the selected business.
Industrial Safety and Environment	CO1	Attain the basic fundamentals safety management
	CO2	Understand the safety various industrial safety acts
	CO3	Acquire basic knowledge of different type of industrial hazards
	CO4	Understand the concepts of environmental safety
Micro Electro Mechanical Systems	CO1	Understand various MEMS fabrications processes including additive, subtractive, patterning, material modification processes and mechanical steps.
	CO2	Understand workings of MEMS mechanical and thermal sensors and actuators
	CO3	Understand mechanisms of MEMS magnetic sensors and actuators and Micro-fluidic devices
	CO4	Understand mechanisms of MEMS optical and RF devices.
	CO5	Be exposed to MEMS simulation software's, Multiscale simulations, CNT and NEMS.
Optimization Techniques	CO1	Solve linear multivariable optimization using linear programming and perform Sensitivity analysis.
	CO2	Solve single-variable, non-linear, unconstrained optimization problems
	CO3	Solve geometric programming optimization problems using standard techniques for each case.
Renewable Energy	CO1	Define different kinds of solar radiation.
	CO2	Utilize different methods of collection of solar energy and storage of solar energy.
	CO3	Classify different types of wind mills and biogas digesters.
	CO4	Classify different types of geothermal energy sources and utilize different types of extracting techniques.
	CO5	Distinguish different kinds of direct energy conversion techniques.
Advanced Materials	CO1	Understand the need and explain different types of composite materials.
	CO2	Summarize the various methods for manufacturing of the composite materials.
	CO3	Distinguish between the properties and uses of different reinforcement fibres.
	CO4	Explain the principles, types and applications of different functionally graded materials and shape memory alloys.
	CO5	Outline the evolution, history, applications and impact of nanotechnology.
Total Quality Management	CO1	Develop an understanding on quality management philosophies and frameworks.
	CO2	Understand the fundamental principles of total quality management.
	CO3	Choose approximate statistical techniques for improving processes.
	CO4	Develop in-depth knowledge on various tools and techniques of quality management.
	CO5	Know what cultural transformation is necessary for successful implementation of total quality practices with his/her organization.

Microwave Engineering Lab	CO1	Draw the characteristics of microwave devices.
	CO2	Determine scattering parameters of various microwave components
	CO3	Compute the various microwave measurements.
	CO4	Analyze various parameters of Waveguide Components
	CO5	To measure the power of RF Components such as directional Couplers
VLSI Lab	CO1	Verify the outputs of combinational circuits using Xilinx software
	CO2	Analyze the outputs of multiplexer using Xilinx software
	CO3	Develop sequential circuit using Xilinx software
	CO4	Verify the outputs of code generators
Cellular and Mobile Communications	CO1	Identify the limitations of conventional mobile telephone system, Understand the operation of cellular system.
	CO2	Analyze the concept of frequency Reuse channels, Deduce the Co-channel interference reduction factor.
	CO3	Design of Antenna system to reduce Co-channel interference.
	CO4	Analyze about cell site and mobile antennas, frequency management and channel assignment strategies.
	CO5	Define Handoff, Distinguish types of handoffs and evaluation of dropped call rates.
Optical Communications & Networks	CO1	Generalize the basic operating principles of single mode and multimode fibers.
	CO2	Analyze and compare optical sources and detectors from both physical and system point of view.
	CO3	Define the parameters of optical fibers and interpret the various optical losses in optical fiber.
	CO4	Estimate power budget for an optical link
	CO5	Describe the different components of optical fiber networks.
Advanced signal processing	CO1	Define the properties of DFT and recall the importance of FFT algorithm.
	CO2	Describe the concept of multi rate signal processing and sample rate conversion.
	CO3	Convert the filter design specification into filter parameters.
	CO4	Define parametric power spectral analysis methods of signals.
	CO5	Define non parametric power spectral analysis methods of signals.
Advanced Computer Architecture	CO1	Infer knowledge on Hardware and System Design concepts.
	CO2	Learn about memory hierarchy and performance of cache memory.
	CO3	Design E-cube routing in Hypercube computers and X-Y routing in 2-D mesh.
	CO4	Justify identify permissible latencies and forbidden latencies for the given non-linear pipeline.
	CO5	Distinguish between RISC and CISC architectures.
	CO6	Design the input-output connections in an Omega Network using perfect shuffle method.

Mixed signal IC design	CO1	Learn analysis of switched capacitor circuits.
	CO2	Know dynamics of PLL blocks.
	CO3	Demonstrate the fundamentals of data converters.
	CO4	Classify data converters.
	CO5	Compare different data converters
Operating Systems	CO1	Describe the role of operating system and explain the different structures of operating system
	CO2	Explain process management and compare the performance of various process scheduling algorithms.
	CO3	Propose solutions for achieving process synchronization
	CO4	State the conditions that lead to deadlock and apply deadlock prevention, detection, avoidance algorithms
	CO5	Discuss different memory management techniques, file system design tradeoffs.
	CO6	Familiarize with disk scheduling, device drivers, protection and security mechanisms
Global Positioning System and its applications	CO1	Summarize the working principle of GPS and its history
	CO2	Demonstrate the operation of all segments and utilize various codes
	CO3	Explain how satellites are arranged in space
	CO4	Develop new navigation solutions for determining accurate user position
	CO5	Design a navigation solution by minimizing the GPS errors
Data Warehousing & Data Mining	CO1	Recognize types of data, data quality, need of preprocessing and different measures of Similarity and dissimilarity.
	CO2	Differentiate between methods for modeling multidimensional data, design and implement Data warehouse.
	CO3	Explain in detail major techniques and algorithms involved in data mining, including techniques and algorithms for data preprocessing, association rule mining, data classification, and data clustering.
	CO4	Evaluate the performance of a classifies.
	CO5	Compare and contrast different clustering algorithms.
	CO6	Apply data mining algorithms and techniques adaptively to real world problem solving.
Embedded & real time operating systems	CO1	Describe the basics of an embedded system.
	CO2	Explain the state machine models &concurrent process models.
	CO3	Explain the concepts of different communication interfaces.
	CO4	Explain the various real time operating system concepts.
	CO5	Describe the Linux & real-time operating system.
Soft computing techniques	CO1	Explain the learning and adaptation capability of neural and fuzzy systems and genetic algorithm.
	CO2	Describe the learning and retrieval procedures of various neural networks.

	CO3	Comprehend the fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
Network security & Cryptography	CO1	Recall different Security Attacks, Services and Mechanisms.
	CO2	Classify and explain categories of different encryption and decryption techniques.
	CO3	Identify the authentication applications such as Kerberos and x.509 directory services.
	CO4	Analyze the usage of PGP and S/MIME.
	CO5	Familiar with the importance of IP Security and Web Security.
	CO6	Exposed to viruses and related threats and design principles of firewalls.
Internship	CO1	Understand the concepts of electronics &communication engineering
	CO2	Improve communication skills and team work.
	CO3	Improve the report writing skills
Project Work	CO1	Identify and find solution to real time problems and application of Electronics & Communication concepts for solving it
	CO2	Analyze the industry oriented problems
	CO3	Apply the advanced software tools to solve the identified problems
	CO4	Improve the reporting writing skills
	CO5	Improve communication skills and team work

DEPARTMENT OF MECH - A.Y: 2017-18

Program Outcomes	
PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	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.
PO3	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.
PO4	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.

PO5	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.
PO6	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.
PO7	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.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.
PO11	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.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes

PSO1	Analyze, design and evaluate mechanical components as per given specifications using Engineering and Design Analysis software tools.
PSO2	Operate and maintain thermal systems including IC engines, refrigeration & air-conditioning, and power generating systems.
PSO3	Develop process plans and apply modern methods to manufacture components and systems with quality assurance

COURSE OUTCOMES

ENGLISH	CO1	• Read and comprehend seen and unseen passages and answer questions based on them.
	CO2	• Interpret the content of a passage and state their perspective.
	CO3	• Understand words and their meanings, and know prefixes, suffixes, analogies, synonyms, antonyms and one word substitutes.
	CO4	• Use articles, quantifiers, gerunds, infinitives, present participles and tenses appropriately.

	CO5	• Write sentences, paragraphs, formal letters, emails, short essays on any given topic.
EM-I	CO1	• Solve the 1st order differential equations by identifying the suitable method.
	CO2	• Solve the 2nd and higher order differential equations and perform simple applications in Engineering.
	CO3	• Estimate the maxima and minima of two variable functions under different constraints.
	CO4	• Evaluate a multiple integral and apply to estimate the volume and surface area of the solids.
	CO5	• Calculate grad, divergence, curl; a line, surface and volume integral. To find work done, area, and volume. Apply the vector integral theorems to evaluate multiple integrals.
EM(S)	CO1	• Construct free body diagrams and develop appropriate equilibrium equations.
	CO2	• Simplify the system of forces and moments to equivalent systems and analyze systems with friction.
	CO3	• Determine the axial forces in the members of determinate truss.
	CO4	• Determine centroid and moment of inertia for composite areas.
	CO5	• Develop the equilibrium conditions in terms of virtual work.
EC	CO1	• Different moulding techniques of plastic material.
	CO2	• Determine total hardness of water by EDTA method.
	CO3	• Design the metallic materials to prevent corrosion.
	CO4	• Apply suitable lubrication mechanisms for various machinery parts.
	CO5	• Demonstrate the working of Photovoltaic cell.
ED	CO1	• Construct polygons, conics, cycloid and scales (plain, diagonal, vernier).
	CO2	• Draw projection of points and straight lines in any quadrant, and determine its true length and true inclination.
	CO3	• Project plane surfaces inclined to both reference planes using first angle projection.
	CO4	• Draw projections of simple solids inclined to one reference plane only.
	CO5	• Convert orthographic views into isometric projections and vice-versa.
CP	CO1	• Understand the fundamentals of C programming.
	CO2	• Choose loops and decision making statements for problem solving.
	CO3	• Implement different operations on arrays and solve problems using functions.
	CO4	• Understand pointers, structures and unions.
	CO5	• Implement file operations in C programming for a given application.
BECS LAB	CO1	• Pronounce words accurately based on the knowledge of speech sounds and use appropriate intonation patterns in speech.
	CO2	• Comprehend audio and video clips of different accents.
	CO3	• Describe / discuss / explain a given situation / context well.
	CO4	• Read and recall what they have read.
	CO5	• Understand and interpret information provided in graphs, tables etc.
EC LAB	CO1	• Determine Dissolved Oxygen. and Turbidity of water samples.

	CO2	• Explain the importance of viscosity, Flash point and Acid value of a lubricant.
	CO3	• Determine the amount of acid or base by pH metric and conductometric titrations.
	CO4	• Determine the hardness of various water samples.
	CO5	• Operate all the instruments in the chemistry laboratory analysis.
CP LAB	CO1	• Solve the given problem using the syntactical structures of C language.
	CO2	• Develop, execute and document computerized solution for various problems using the features of C language.
	CO3	• Design programs involving decision structures and loops.
	CO4	• Implement modularity and code reusability concepts using functions.
	CO5	• Read and write C programs that uses pointers, structures and files.
ECP	CO1	• Use grammar appropriately in speech and writing.
	CO2	• Describe, discuss, explain and interpret a given situation / context effectively.
	CO3	• Read texts and listen to lectures and make notes on them.
	CO4	• Apply reading techniques in their other subjects.
	CO5	• Summarize, paraphrase and review a piece of writing efficiently.
ES	CO1	• Recognize the general issues of environment and know how to conserve the environment, speak well again on various resources, present status and their better usage.
	CO2	• Explain the interdependency of life in the ecosystem, demonstrate the structural and functional setup, classify and appraise the importance of diversity on the earth and differentiate the conservation methods.
	CO3	• Examine the various types of pollutants and their impacts along with their control methods; review the different types of solid wastes, impacts and their ecofriendly disposal methods.
	CO4	• Translate the concept of sustainable development by green technologies, experiment on the environmental management systems for clean, green, safe and healthy environment through clean development mechanisms.
	CO5	• Evaluate the changing trends of population curves among different nations, discuss how to limit the current population size, collect and compile the information to document the environmental assets.
EM-II	CO1	• Solve the algebraic and transcendental equations by identifying suitable numerical methods, estimate a linear and non-linear curve to the given data by the method of least squares, calculate the value of dependent variable for a particular x by deducing the unknown function y = f(x) for an evenly or unevenly spaced points.
	CO2	• Estimate the value of derivatives, evaluate the definite integrals using different numerical methods and evaluate an IVP.
	CO3	• Deduce Laplace transform of different continuous functions using different properties and solve an I.V.P & B.V.P applying Laplace transform.
	CO4	• Evaluate the Fourier series and half range series expansions of different functions for different intervals.

	CO5	• Solve a linear and non-linear 1st order partial differential equation and using method of separation of variables evaluate a wave equation & heat equation
BEE	CO1	• Ability to analyze electrical circuits for both DC and AC .
	CO2	• Identify and Define different types of dc generators.
	CO3	• Ability to generalize AC machines.
	CO4	• Classify different types of measuring instruments.
	CO5	• To outline semiconductor devices.
EM(D)	CO1	• Determine the mass moment of inertia of rigid bodies.
	CO2	• Determine the kinematic relations of particles & rigid bodies.
	CO3	• Apply equations of motion to particle and rigid body.
	CO4	• Analyze motion of particles & rigid bodies using the principle of energy and momentum methods.
	CO5	• Apply the concepts of relative velocity and instantaneous center method.
EP	CO1	• Apply the principles of optics in designing optical devices
	CO2	• Outline the Principles of Lasers and Fiber Optics
	CO3	• Resolve the discrepancies in classical estimates through quantum principles
	CO4	• Interpret the knowledge of Magnetic Properties in Material Fabrication
	CO5	• Explain the response of E-Field on Dielectric Materials to control the device performance
EEE LAB	CO1	• Analyze DC electrical circuits.
	CO2	• Determine performance of DC machines.
	CO3	• Interpret performance of AC Machines.
	CO4	• Understand the transistor characteristics.
	CO5	• Distinguish the full wave rectifier with and with our filters.
EWSP LAB	CO1	• Make half-lap, mortise & tenon, corner dovetail or bridle wooden joints.
	CO2	• Develop sheet metal into objects like square tray, taper side tray, conical funnel or elbow pipe.
	CO3	• Forge MS rod from round to square cross-section, or into L- or S-bend.
	CO4	• Fabricate MS pieces into either a straight, square, dovetail or V-fit.
	CO5	• Connect a staircase or a tube light house-wiring electrical circuit.
EP LAB	CO1	• Infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum.
	CO2	• Apply classic experimental techniques to comprehend the phenomenon of resonance with equipment such as sonometer, Melde's apparatus and volume resonator to measure desired properties.
	CO3	• Demonstrate the ability to measure properties of optical systems and design instrumentation with precision measurements to estimate error for targeted accuracy.
	CO4	• Illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics.

	CO5	• Evaluate characteristics of magnetic, dielectric and semiconducting material devices.
MOS	CO1	• Compute normal, shear, principle stresses and strain energy of components subjected to external forces and temperature changes.
	CO2	• Compute shear force and bending moments for statically determinate cantilever or simply-supported beams subjected to various loads.
	CO3	• Determine flexural stresses and deformations using bending formula, and shear stresses and deformations using shear formula.
	CO4	• Compute beam deflections using double integration, Macaulay and moment-area methods.
	CO5	• Calculate longitudinal, hoop and radial stresses for thin and thick, simple and compound cylinders subjected to both internal and external pressures.
EMMS	CO1	• Gain thorough knowledge in engineering materials and their structures.
	CO2	• Understand necessity of alloying and effect of alloying element on properties of materials.
	CO3	• Understand thoroughly Iron carbon equilibrium diagram.
	CO4	• Describe different types of cast irons and steels.
	CO5	• Gain knowledge of heat treatment processes and powder metallurgy.
PT	CO1	• Outline functions, types and design considerations of various elements of casting process including patterns, molding materials especially of sand, gating, riser, runner and melting furnaces.
	CO2	• Comprehend the working of different welding processes including arc, gas, resistance and other weldings, along with their subtypes of welding.
	CO3	• Calculate rolling process parameters, and understand both forming and rolling processes.
	CO4	• Explain principles of various kinds of extrusion, drawing, forging and sheet metal working processes.
	CO5	• Explain various high velocity forming processes and plastic injection and blow molding processes.
TD	CO1	• Apply basic concepts, zeroth law and first law to non-flow processes of thermodynamics.
	CO2	• Apply steady flow energy equation to flow systems, and second law and entropy calculations to thermodynamic components.
	CO3	• Calculate available and unavailable energies, determine irreversibility, and apply Maxwell’s equations. Determine energy transferred using equations and Mollier charts for pure substances with phase transformation.
	CO4	• Determine properties of mixtures from the properties of its constituents and composition. Calculate energy transfers in various psychrometric processes using psychrometric properties.
	CO5	• Derive thermal efficiency and mean effective pressures for various thermodynamic cycles and compare their performances.

CVSM	CO1	• Can identify an analytic function, harmonic function; find harmonic conjugate function via Cauchy-Riemann equations.
	CO2	• Can identify and classify zeros and singular points of a function, calculate the residues by residue theorem and evaluate integrals using the Cauchy Integral formulae.
	CO3	• Can find Laurent series expansion of complex functions for different region of convergence and calculate the residues by Laurent Series.
	CO4	• Can apply Baye's theorem to solve industry related problems, recognize where the use of certain standard probability distributions would be appropriate.
	CO5	• Can use appropriate tabular and graphical formats for displaying univariate (bivariate) data sets and carry out correlation, regression analysis.
AEDP	CO1	• Draw auxiliary views of regular planes and solids on auxiliary planes.
	CO2	• Draw sectional views of prisms and pyramids resting on their base.
	CO3	• Draw sectional views of cylinders, right circular cones resting on their base.
	CO4	• Develop lateral surfaces of right regular solids and transition pieces.
	CO5	• Generate views of interpenetrated simple solids like cylinder & cylinder, cylinder & prism, cylinder & cone.
ACSL LAB	CO1	• State meanings, synonyms, antonyms, analogies, idioms, phrases, one word substitutes, word roots, prefixes and suffixes for words in general.
	CO2	• Present and interpret data on select topics using pre-existing slides.
	CO3	• Contribute proactively and extrapolate in group discussions.
	CO4	• Prepare résumé / CV and face interview.
	CO5	• Develop communication skills by playing different roles.
MOS/MET LAB	CO1	• Find mechanical properties of given specimen using tension test, compression test, bending test, shear test on universal testing machine.
	CO2	• Determine modulus of rigidity of a given specimen using torsion test.
	CO3	• Grade the specimen by conducting Izod and Charpy impact test.
	CO4	• Determine the hardness of different specimens using Brinell and Rockwell hardness tests.
	CO5	• Compute spring stiffness by measuring spring deformations for applied loads.
PT LAB	CO1	• Prepare green sand mold for single-piece and multi-piece patterns.
	CO2	• Create joints using electric arc, spot, gas welding techniques.
	CO3	• Outline practical procedure for TIG and MIG welding.
	CO4	• Form plastic parts using injection and blow molding.
	CO5	• Fabricate a pipe bend and a washer using hydraulic and mechanical press.
FMHM	CO1	• Define various physical properties of fluids, and understand how manometers are used to measure fluid pressure. List various flow classifications.
	CO2	• Derive and solve problems based on continuity equation. Apply Euler, Bernoulli, Navier-Stokes, Impulse-momentum equations to solve practical fluid flow problems.

	CO3	• Compute losses in fluid flow using Darcy Weisbach equation. Explain and solve problems based on various flow measurement devices.
	CO4	• Illustrate mechanism and construction of various Hydraulic Turbines like Pelton wheel, Kaplan and Francis. Compute efficiencies and select suitable turbine using characteristic curves, governing and cavitation.
	CO5	• Calculate efficiency and performance characteristics of centrifugal and reciprocating pumps.
TE-I	CO1	• Analyze air standard, fuel air and actual air cycles in terms of various losses. Understand construction, working and mechanism of engine subsystems.
	CO2	• Describe combustion processes occurring in SI engines. Identify the factors affecting flame speed, ignition lag, flame propagation and knocking.
	CO3	• Describe processes of combustion in CI engine and effect of various parameters. Explain diesel knock reduction methods like swirl and auto-ignition.
	CO4	• Calculate engine performance using various parameters and heat balance sheet.
	CO5	• Explain operating and working principles of rotary, reciprocating and axial flow compressors.
MEFA	CO1	• Learn demand analysis, demand determinants and law of demand.
	CO2	• Understand demand forecasting and its governing factors.
	CO3	• Understand theory of cost analysis and production.
	CO4	• Understand market structures and types of market competition.
	CO5	• Understand financial accounting including double-entry book keeping, journal, ledger and final accounts.
MD	CO1	• Represent the conventions of different machine components.
	CO2	• Draw simple machine elements including screw threads, bolts, nuts and keys.
	CO3	• Draw simple machine elements including cotter and knuckle joints, riveted joints, shaft couplings, journal and foot-step bearings.
	CO4	• Draw assembly drawings of engine parts like stuffing box, steam engine cross head, eccentric, connecting rod, piston etc.
	CO5	• Draw assembly drawings of other machine parts like screw jack, vice, Plummer block, lathe tailstock, and valves like steam stop valve, spring loaded safety valve, feed check valve etc.
FMHM LAB	CO1	• Conduct impact of jet on vanes, and performance test on Pelton wheel.
	CO2	• Conduct performance tests on Francis turbine and Kaplan turbine.
	CO3	• Conduct performance tests on single-stage and multi-stage centrifugal pump and reciprocating pump.
	CO4	• Calibrate Venturimeter and orifice meter.
	CO5	• Determine head loss and friction factor for a given pipeline.
MCMT	CO1	• Assess machinability of different materials using specific cutting forces and surface finish. Explain theory of metal cutting including cutting tool geometry, materials, life and wear.

	CO2	• Describe basic parts and various operations performed on lathe. Explain the mechanisms used in various special purpose lathes.
	CO3	• Discuss parts, working principles, operations and applications of shaping, slotting, planning, milling, drilling, broaching and grinding machines.
	CO4	• Explain gear cutting, gear forming, gear generation, gear shaping and gear hobbing.
	CO5	• Explain constructional details, working principles and applications of CNC machines.
DOM	CO1	• Enumerate Dynamic Analysis of Four bar Linkage and Slider crank Mechanism. Evaluate energy stored and dimensions of flywheel.
	CO2	• Explain working principles of different governors. Solve problems on gyroscopic effects in ships, automobiles and airplanes.
	CO3	• Discuss the working principles and types of clutches and brakes. Calculate frictional forces in clutches and brakes.
	CO4	• Evaluate various cases of balancing of rotating masses. Use analytical and graphical methods for primary and secondary balancing of reciprocating masses.
	CO5	• Compute natural frequencies of free and forced, undamped and damped, 1 and 2 dof, longitudinal, transverse and torsional vibrating spring mass systems. Explain whirling of shafts, vibration isolation and transmissibility.
DMM-II	CO1	• Design journal, ball, roller and thrust bearings with adequate bearing life and heat dissipation.
	CO2	• Compute dimensions of connecting rod, crank and crankshaft that can sustain various loads.
	CO3	• Design piston and cylinder for structural and thermal loads. Design power transmission components like flat & v-belts, ropes, chains, pulleys for belt and rope drives.
	CO4	• Calculate major dimensions of spur and helical gears for dynamic loads, bending strength, compressive strength and wear.
	CO5	• Design power screws and screw jack along with the nut. Design machine tool beds, slide ways, spindles for strength and rigidity.
CADCAM	CO1	• Describe CAD devices and software, graphic standards. Apply 2D & 3D transformations and inverse transformations.
	CO2	• Develop mathematically synthetic curves and surfaces including Bezier curves and NURBS. Understand Boundary Representation (B-rep and Constructive Solid Geometry (CSG solid modeling methodologies.
	CO3	• Write simple CNC programs to perform different operations like turning and milling.
	CO4	• Explain group technology concepts, especially MICLASS and OPITZ coding systems in production to facilitate cellular and flexible manufacturing. Develop automated process plans using variant and generative approaches.
	CO5	• Differentiate steps involved in migrating from conventional manufacturing to FMS & CIM.

TE-II	CO1	• Calculate thermal efficiency of Rankine cycle with and without reheating and regeneration. Determine stoichiometric air required after converting from volumetric to mass analysis and vice-versa.
	CO2	• Describe the function and working of various types of boilers along with its mountings and accessories. Calculate the boiler efficiency, chimney height for natural draught, and power to drive the fans.
	CO3	• Design a nozzle for given requirements and calculate its efficiency. Understand the working of various types of steam condensers along with determining mass of cooling water required.
	CO4	• Determine the performance of simple and compounded, impulse and multi-stage reaction turbines by drawing velocity diagrams and computing various efficiencies.
	CO5	• Calculate efficiency of Brayton cycle along with reheating, regeneration and intercooler used in gas turbines. Describe the working principles of Ramjet, Pulsejet, Turbojet and Turboprop engines.
3D MOD LAB	CO1	• Design 3D models using operations like extrude, revolve, shell, sweep etc.
	CO2	• Design 3D models using features like move, pattern, mirror, fillet, chamfer etc.
	CO3	• Create 2D surfaces using simple surfacing operations.
	CO4	• Assemble individual 3D components using various assembly constraints.
	CO5	• Draft 3D models to create 2D drawings including various views.
TE LAB	CO1	• Measure and draw valve and port timing diagrams on IC engines.
	CO2	• Determine engine frictional power by motoring, retardation and Morse tests.
	CO3	• Conduct economical speed test and heat balance test on an engine.
	CO4	• Conduct performance tests on 4-stroke diesel, 2-stroke petrol engines.
	CO5	• Conduct performance test on multi-stage reciprocating air compressor. Study various types of boilers with its mountings and accessories.
MT LAB	CO1	• Generate plain and tapered steps using turning operations on lathe machine.
	CO2	• Develop threads and knurled surfaces by using lathe machine.
	CO3	• Perform drilling, Tapping slotting, shaping, Planning operations using respective machines.
	CO4	• Operate milling machine and produce various milled surfaces.
	CO5	• Create smooth surface by using surface grinding machine.
MET	CO1	• Calculate tolerances and allowances for different limits and fits.
	CO2	• Determine linear and angular measurements by using various instruments. Design different kinds of go and no-go gauges.
	CO3	• Compute various dimensions using optical measuring instruments. Perform flat surface measurements using optical flats and auto collimator.

	CO4	• Assess surface roughness using CLA, Rt, RMS, Rz, and also by profilograph and talysurf instruments. Understand working principles of various mechanical, electrical, electronic, pneumatic comparators.
	CO5	• Conduct screw thread and gear measurements, machine tool alignment tests.
ICS	CO1	• Define basic principles of measurement systems, and describe dynamic performance characteristics and sources of error. Describe various pressure measuring instruments.
	CO2	• Explain various stress, strain, temperature and flow measuring instruments.
	CO3	• Explain various displacement, acceleration, force, torque, power and speed measuring instruments.
	CO4	• Design control systems using time-domain analysis techniques like pole placement, root locus and Routh-Hurwitz criterion.
	CO5	• Design control systems using frequency-domain analysis techniques like Nyquist, Bode plots. Design PID controllers.
IEM	CO1	• Explain the merits, demerits and suitability of different kinds of organizational structures.
	CO2	• Explore the differences between different types of layouts and production methods. Select the most suitable combination of layout and method that brings efficiency in operations.
	CO3	• Perform work study and work measurement involving work sampling along with motion and time studies on different tasks.
	CO4	• Conduct inventory analysis like ABC, VED and understand the different tasks involved in purchase and materials management.
	CO5	• Apply statistical quality control tools and follow total quality management procedures to attain quality standards.
HT	CO1	• Derive general heat conduction equation in cartesian, cylindrical and spherical coordinates. Determine heat conducted through both simple and composite plane walls, cylinders and spheres.
	CO2	• Determine heat conducted through simple shapes with internal heat generation, and through various kinds of fins. Determine transient unsteady temperature distribution for simple shapes using Heisler charts.
	CO3	• Determine heat convected in forced convection of both external and internal flows, laminar and turbulent flows, over plates, cylinders, spheres and tube banks.
	CO4	• Determine heat convected in natural convection for flow over a plate. Understand and solve problems in pool boiling and condensation. Perform heat exchanger analysis and design using LMTD and NTU methods.
	CO5	• Apply various radiation laws, computer shape factors for simple configurations, use electrical analogy for radiation problems and design radiation shields.
OR	CO1	• Formulate, solve linear programming problem using graphical and simplex method along with its Big-M and 2-Phase variations.
	CO2	• Solve both balanced and unbalanced transportation and assignment problems.

	CO3	• Solve sequencing problems with n-jobs & m-machines. Compute queue performance characteristics for various queuing models.
	CO4	• Solve replacement and game theory problems by applying standard solution methods.
	CO5	• Calculate critical path for a given network using PERT and CPM techniques.
AE	CO1	• Explain construction and operation of components of engine and its lubrication system, along with engine specifications, service procedures.
	CO2	• Explain the operation of the components involved in both carburetor based and direct fuel injection based fuel systems.
	CO3	• Explain the working of components involved in the cooling system. Describe the mechanism of distributor-based and electronic ignition systems.
	CO4	• Explain mechanism of starting and charging electrical systems, and electrical accessories. Discuss construction and operation of transmission system components including clutch, gearbox, propeller shaft, differential, axles, wheels and tires.
	CO5	• Explain construction and operation of steering, suspension and braking system components.
MET/INST LAB	CO1	• Measure length, diameter, bore, angle, taper, flatness using various instruments.
	CO2	• Measure gears and thread by mechanical methods. Use toolmakers microscope for optical measurements.
	CO3	• Conduct machine tool alignment test on lathe and milling machine.
	CO4	• Measure pressure, temperature, using various instruments.
	CO5	• Measuring using capacitive transducers, LVDT, stroboscope.
PDP	CO1	• Draw individual part drawings from the given assembly drawing.
	CO2	• Represent dimensional and geometrical tolerances on part drawings.
	CO3	• Represent surface finish data on part drawings.
	CO4	• Fill up process sheet for a given component.
	CO5	• Draw production drawing of an assembly using CAD software.
RAC	CO1	• Perform thermodynamic analysis on various refrigeration cycles like Bell-Coleman cycle and Brayton cycle.
	CO2	• Describe components and analyze COP of vapor compression cycles including sub-cooling and super-heating. Explain the working of condensers, refrigerants, evaporator and expansion devices.
	CO3	• Describe components and analyze COP of vapor absorption cycles. Explain the working of essential components of vapor absorption refrigeration.
	CO4	• Explain the working principles of non-conventional refrigeration systems like thermo-electric, vortex-tube and pulse tube refrigeration systems.
	CO5	• Solve problems based on RSHF, GSHF, ESHF and ADP. Calculate air-conditioning cooling load.
FEM	CO1	• Explain fundamental relations of elasticity, concepts of variational principles, basics of domain discretization using different types of elements, interpolation functions.

	CO2	• Derive element stiffness matrices, assemble them for global stiffness matrix and solve system of linear equations to find displacements, reaction forces, strains and stresses.
	CO3	• Analyze plane trusses and solve plane stress, plane strain problems using 2D CST elements.
	CO4	• Analyze beams and 2D isoparametric problems with internal nodes using numerical integration procedures.
	CO5	• Evaluate Eigen values and Eigen vectors for both consistent and lumped mass matrix approaches for1D bar and beam elements. Solve composite slab and 1D fin problems on steady state heat transfer using FEA.
IHP	CO1	• Explain mechanism and calculations of various types of hydraulic pumps, motors, actuators.
	CO2	• Describe workings of different types of direction, pressure, flow valves, and accumulators.
	CO3	• Design and draw commonly used simple hydraulic circuits.
	CO4	• Describe workings of various components in pneumatic and electro-pneumatic systems.
	CO5	• Design and draw commonly used simple pneumatic circuits.
PPE	CO1	• Describe various conventional and non-conventional sources of energy. Various direct energy conversion methods.
	CO2	• Explain construction & working of steam power plants along with its major subsystems, mountings and accessories including combustion of coal.
	CO3	• Describe diesel and gas turbine power plants with auxiliary systems.
	CO4	• Describe construction and working of hydro-electrical and nuclear power plants.
	CO5	• Assess the power plant economy and cost analysis.
TQM	CO1	• Develop an understanding on quality management philosophies and frameworks.
	CO2	• Understand the fundamental principles of total quality management.
	CO3	• Choose approximate statistical techniques for improving processes. Evaluate reliability for complex systems.
	CO4	• Develop in-depth knowledge on various tools and techniques of quality management.
	CO5	• Understand ISO and QS certification process and its need for the industries.
IHP LAB	CO1	• Design hydraulic actuator speed control circuit.
	CO2	• Design hydraulic single and double acting cylinder circuits.
	CO3	• Design hydraulic bleed-off, sequence valve, transverse and feed circuits.
	CO4	• Design pneumatic single and double acting cylinder circuits.
	CO5	• Work with pneumatic motor, Non return valve, shuttle valve, 5/2, 3/2 way valves.
HT LAB	CO1	• Evaluate heat transfer through lagged pipe, Insulating powder.
	CO2	• Determine the Thermal conductivity of a given metal Rod and overall heat transfer coefficient for a composite slab.

	CO3	• To Measure the Heat transfer coefficient for Pin Fin, Forced convection, Natural Convection, and Drop and Film wise condensation.
	CO4	• Determine heat transfer in parallel-flow and counter-flow heat exchanger.
	CO5	• Determine radiation heat transfer using Stefan-Boltzman and emissivity apparatus.
CAE LAB	CO1	• Determine deflections and stresses in 1D & 2D bars, trusses and beams; and 2D plane stress, plane strain, axisymmetric models by conducting static FE analysis.
	CO2	• Determine deflections and stresses in 3D bodies, 3D shell components by conducting static FE analysis.
	CO3	• Estimate natural frequencies and mode shapes, harmonic response of 2D beams using FEA.
	CO4	• Conduct steady state thermal analysis on 2D and 3D models.
	CO5	• Develop NC program to create simple components on NC lathe or mill in a CAM package. Simulate the tool path and check for errors in virtual manufacturing environment.
PPC	CO1	• Describe the objectives and functions of PPC and the types of production. Evaluate different types of forecasting techniques.
	CO2	• Apply aggregate planning strategies. Discuss line balancing and planning methods.
	CO3	• Evaluate MRP and JIT systems against traditional inventory control systems.
	CO4	• Apply scheduling techniques to production systems.
	CO5	• Draw route sheets. Explain activities of dispatching and expediting.
IA	CO1	• Explain the types and strategies of automation.
	CO2	• Determine the problems and assess the performance of automated flow lines in manufacturing domain.
	CO3	• Identify the bottlenecks occurred in production systems and will be able to balance the production line.
	CO4	• Distinguish between different material handling systems and employ suitable material handling system. Explain various automated storage and retrieval systems.
	CO5	• Discuss computer aided inspection methods including CMM and machine vision. Explain BPRE, CE and rapid prototyping methodologies.
UCMP	CO1	• Describe the need for, and applications of UCMP. Explain the considerations in process selection. Describe USM.
	CO2	• Describe AJM, WJM and AWJM processes along with material removal rate.
	CO3	• Explain ECM processes like honing, deburring, ECG along with material removal rate and mechanics of cutting.
	CO4	• Describe EDM, EDG and Wire EDM processes along with material removal rate and mechanics of cutting.
	CO5	• Describe EBM, LBM and PAM processes along with material removal rate and mechanics of cutting.

PROJ	CO1	• Select relevant information from various sources including internet, library, journals, mechanical engineering magazines to define the problem.
	CO2	• Comprehend principles pertaining to mechanical engineering that enables him to complete the project.
	CO3	• Gain technology implementation skills by applying them to a new problem which may be the design and manufacture of a product, a research investigation, experimental, software or management project by using advanced equipment and software.
	CO4	• Work as an individual and as a team including division of tasks, scheduling and monitoring the progress.
	CO5	• Adhere to professional standards and ethics.
	CO6	• Research various avenues for solving issues that arise during project implementation thereby inculcate lifelong learning.
	CO7	• Write effective technical reports and demonstrate his/her work.

Program Outcomes

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	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.
PO3	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.
PO4	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.
PO5	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.
PO6	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.
PO7	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.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.
PO11	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.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes

PSO1 Exhibit the basics of Engineering to identify, formulate, design and solve complex problems of Electrical and Electronics Engineering.

PSO2 Practice the application of appropriate techniques of hardware and software tools in power systems, power Electronics and Industrial Automation.

PSO3 Exhibit success in higher studies and competitive examinations in the field of Multi-Disciplinary Environments.

COURSE OUTCOMES

Course Title		Description of the Course Outcome
English	CO1	Students will be able to read and comprehend seen and unseen passages and answer questions based on them.
	CO2	Students will be able to interpret the content of a passage and state their perspective.
	CO3	Students will be able to understand words and their meanings, and know prefixes, suffixes, analogies, synonyms, antonyms and one word substitutes.
	CO4	Students will be able to use articles, quantifiers, gerunds, infinitives, present participles and tenses appropriately.
	CO5	Students will be able to write sentences, paragraphs, formal letters, emails, short essays on any given topic
Environmental Studies	CO1	Recognize the general issues of environment and know how to conserve the environment, speaks well again on various resources, present status and their better usage.
	CO2	Explain the interdependency of life in the ecosystem, demonstrate the structural and functional setup, classify and appraise the importance of diversity on the earth and differentiate the conservation methods.
	CO3	Examine the various types of pollutants and their impacts along with their control methods; review the different types of solid wastes, impacts and their ecofriendly disposal methods.
	CO4	Translate the concept of sustainable development by green technologies experiment on the environmental management systems for clean, green, safe and healthy environment through clean development mechanisms.
	CO5	Evaluate the changing trends of population curves among different nations, discuss how to limit the current population size, collect and compile the information to document the environmental assets.Estimate the trajectory and range of missiles in defense
ENGINEERING MATHEMATICS – I	CO1	Solve the 1^{st} order differential equations by identifying the suitable method.
	CO2	Identify and solve a 2^{nd} and higher order differential equations and perform simple applications in Engineering.
	CO3	Estimate the maxima and minima of two variable functions under different constraints.

	CO4	Solve a multiple integral and apply to estimate the volume and surface area of the solids.
	CO5	Calculate grad, divergence, curl; a line, surface and volume integral. To find work done, area, and volume. Apply the vector integral theorems to evaluate multiple integrals.
ENGINEERING CHEMISTRY	CO1	Different moulding techniques of plastic material.
	CO2	Determine total hardness of water by EDTA method.
	CO3	Design the metallic materials to prevent corrosion.
	CO4	Apply suitable lubrication mechanisms for various machinery parts.
	CO5	Demonstrate the working of Photovoltaic cell.
ENGINEERING MECHANICS	CO1	Know the system of forces and calculate the resultant of different force system.
	CO2	Draw the free body diagram and understand the concept of moment and couple.
	CO3	Know the friction between two mating surfaces and calculate centroid of plane areas.
	CO4	Determine area and mass moment of inertia for different sections.
	CO5	Determine the kinematic relations of particles & rigid bodies.
BASIC ELECTRIC CIRCUIT ANALYSIS	CO1	Able to estimate different electrical circuits.
	CO2	Able to solve circuits using different laws.
	CO3	Able to analyze RLC circuits.
	CO4	Able to summarize resonance.
	CO5	Able to generalize three phase circuits.
ENGINEERING CHEMISTRY LABORATORY	CO1	Determine Dissolved Oxygen. and Turbidity of water samples.
	CO2	Explain the importance of viscosity, Flash point and Acid value of a lubricant.
	CO3	Determine the amount of acid or base by pH metric and conductometric titrations.
	CO4	Determine the hardness of various water samples.
	CO5	Operate all the instruments in the chemistry laboratory analysis
INFORMATION TECHNOLOGY WORKSHOP LAB	CO1	Identify the peripherals of a computer assemble and disassemble the computer system.
	CO2	Summarize the procedure for installation of operating systems and track out the hardware and software trouble shooting.
	CO3	Develop a basic understanding of technologies and protocols used on the internet including current web-based applications, emails, search engines.
	CO4	Create, edit, format word documents.

	CO5	Organize and analyze data with in an excel spread sheet and also present the content usingbasic power point utilities and tools Visualize the solids clearly without any complexity.
BASIC ELECTRICAL ENGINEERING LAB	CO1	Discuss various types of electrical components.
	CO2	Demonstrate various basic laws related to electrical engineering.
	CO3	Demonstrate soldering and bread board precautions.
	CO4	Describe control of lamps.
	CO5	Examine electrical wiring system.
ENGLISH COMMUNICATIO N PRACTICE	CO1	Students will be able to use grammar appropriately in speech and writing.
	CO2	Students will be able to describe, discuss, explain and interpret a given situation / context effectively.
	CO3	Students will be able to read texts and listen to lectures and make notes on them.
	CO4	Students will be able to apply reading techniques in their other subjects.
	CO5	Students will be able to summarize, paraphrase and review a piece of writing efficiently.
ENGINEERING MATHEMATICS – II	CO1	Solve the algebraic and transcendental equations by identifying suitable numerical methods, estimate a linear and non-linear curve to the given data by the method of least squares, calculate the value of dependent variable for a particular x by deducing the unknown function $y = f(x)$ for an evenly or unevenly spaced points.
	CO2	Estimate the value of derivatives, evaluate the definite integrals using different numerical methods and evaluate an IVP.
	CO3	Deduce Laplace transform of different continuous functions using different properties and solve an I.V.P & B.V.P applying Laplace transform.
	CO4	Deduce the Fourier series and half range series expansions of different functions for different intervals.
	CO5	Solve a linear and non-linear 1^{st} order partial differential equation and using method of separation of variables evaluate a wave equation & heat equation
ENGINEERING PHYSICS	CO1	Apply the principles of optics in designing optical devices
	CO2	outline the Principles of Lasers and Fiber Optics
	CO3	resolve the discrepancies in classical estimates through quantum principles
	CO4	Interpret the knowledge of Magnetic Properties in Material Fabrication
	CO5	explain the response of E-Field on Dielectric Materials to control the device performance
Engineering Drawing	CO1	Construct polygons, ellipse and scales (plain, diagonal, vernier).

	CO2	Draw orthographic projection of points and straight lines in any quadrant, and determine its true length and true inclination.
	CO3	Draw projections of plane surfaces inclined to either one or both reference planes.
	CO4	Draw projections of simple solids inclined to one reference plane.
	CO5	Convert orthographic views into isometric projections and vice-versa.
SWITCHING THEORY AND LOGIC DESIGN	CO1	Distinguish number systems and digital codes.
	CO2	Explain the function of various logic functions.
	CO3	Become adept at solving logic functions for economical design of logic circuits.
	CO4	Learn to analyze and design various types of combinational circuits.
	CO5	Learn to analyze and design various types of sequential circuits.
COMPUTER PROGRAMMING	CO1	Understand the fundamentals of C programming.
	CO2	Choose the loops and decision making statements to solve the problem.
	CO3	Implement different operations on arrays and solve problems using functions.
	CO4	Understand pointers, structures and unions.
	CO5	Implement file operations in C programming for a given application.
ENGINEEING PHYSICS LAB	CO1	Student will be able to use Screw Gauge, Vernier Calipers and Travelling Microscope etc. effectively with requisite precision
	CO2	Will be able to best fit a graph or interpolate and extrapolate from series of data points apart from interpreting errors
	CO3	Will be able to measure physical parameters such as Rigidity Modulus, Acceleration due to Gravity, Thickness of a thin film and Radius of Curvature using principles of Mechanics and Wave Optics respectively
	CO4	Will demonstrate Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
	CO5	Students will be able to characterize Dielectric and Semiconducting materials such as Thermistor and Germanium Diode
COMPUTER PROGRAMMING LAB	CO1	Solve the given problem using the syntactical structures of C language
	CO2	Develop , execute and document computerized solution for various problems using the features of C language
	CO3	Design programs involving decision structures and loops.
	CO4	Implement modularity and code reusability concepts using functions.
BASIC ENGLISH COMMUNICATION SKILLS LABORATORY	CO1	Students will be able to pronounce words accurately based on the knowledge of speech sounds and use appropriate intonation patterns in speech.

	CO2	Students will be able to comprehend audio and video clips of different accents.
	CO3	Students will be able to describe / discuss / explain a given situation / context well.
	CO4	Students will be able to read and recall what they have read.
	CO5	Students will be able to understand and interpret information provided in graphs, tables etc.
ELECTRICAL MACHINES-I	CO1	Identify and Define different types of dc generators, interpret their performance under different load conditions.
	CO2	Describe the construction and working principle of various types of DC motors.
	CO3	Distinguish between different types of transformers and compute their equivalent circuit parameters.
	CO4	Analyze the working of any DC machines and transformer under loaded and unloaded conditions
	CO5	Determine the performance of DC machine and Transformers by conducting different tests.
ELECTRONIC DEVICES AND CIRCUITS	CO1	Ability to analyze the structure of different types of semiconductor devices and ability to design rectifiers and filters .
	CO2	Ability to demonstrate an understanding of operational amplifiers and their internal device including BJT, CMOS transistors.
	CO3	Ability to understanding biasing techniques.
	CO4	Ability to analyze Small signal amplifiers.
	CO5	Ability to determine the stability of feedback amplifiers and their steady state performance.
ELECTRICAL CIRCUIT ANALYSIS	CO1	Familiar with Two Port Networks and Ladder Networks.
	CO2	Knows how to apply theorems to both DC and AC circuits.
	CO3	Knows how to analyze a given AC or DC transient circuit.
	CO4	Gains knowledge how to synthesize a circuit.
	CO5	Knows how to analyze the Network functions.
Fluid Mechanics and Hydraulic Machinery	CO1	Define various physical properties of fluids, and understand how manometers are used to measure fluid pressure. List various flow classifications.
	CO2	Derive and solve problems based on continuity equation. Apply Euler, Bernoulli, Navier-Stokes, Impulse-momentum equations to solve practical fluid flow problems.
	CO3	Compute losses in fluid flow using Darcy Weisbach equation. Explain and solve problems based on various flow measurement devices.
	CO4	Illustrate mechanism and construction of various Hydraulic Turbines like Pelton wheel, Kaplan and Francis. Compute efficiencies and select suitable turbine using characteristic curves, governing and cavitation.
	CO5	Calculate efficiency and performance characteristics of centrifugal and reciprocating pumps

POWER SYSTEMS-I	CO1	Students are able to draw the line diagrams and identify different components in the conventional and nonconventional power generating stations.
	CO2	Students can summarize different distribution systems.
	CO3	Students can identify the equipment used in different substations.
	CO4	Students can analyze the economic aspects of power generation and different tariff methods.
	CO5	Students can estimate the necessity of the underground cables
ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY	CO1	Students will be able to state meanings, synonyms, antonyms, analogies, idioms, phrases, one word substitutes, word roots, prefixes and suffixes for words in general.
	CO2	Students will be able to present and interpret data on select topics using pre-existing slides.
	CO3	Students will be able to contribute proactively and extrapolate in group discussions.
	CO4	Students will be able to prepare Résumé / CV and face interview.
	CO5	Students will be able to develop communication skills by playing different roles.
ELECTRONIC DEVICES AND CIRCUITS LAB	CO1	Generalize the working of diodes, transistors and their applications.
	CO2	Compute a common emitter/base/collector amplifier and measure its voltage gain.
	CO3	Differentiate a bias point in a transistor.
	CO4	List to design different types of filters and apply the same to oscillators.
	CO5	Design the circuit, which converts an analog signal to digital signal.
FLUID MECHANICS AND HYDRAULIC MACHINERY LAB	CO1	Conduct impact of jet on vanes, and performance test on Pelton wheel.
	CO2	Conduct performance tests on Francis turbine and Kaplan turbine.
	CO3	Conduct performance tests on single-stage and multi-stage centrifugal pump and reciprocating pump.
	CO4	Calibrate venture-meter and orifice-meter.
	CO5	Determine head loss and friction factor for a given pipeline.
PROFESSIONAL ETHICS AND MORALS	CO1	Realize the importance of human values.
	CO2	Understand that excessive desires of the mind make a person unethical and restless, while fewer desires lead to peace and professional progress.
	CO3	Assess different types of risks involved in unethical practices. Know various means of protesting against unethical practices.

	CO4	Assess the benefits of restraining from unethical practices like bribery, extortion, nepotism, nexus between politicians and industrialists.
	CO5	Summarize case studies of ethical violations in Chernobyl meltdown, Challenger disaster, Ford Pinto design, Kingfisher Airlines financial misappropriation.
ELECTROMAGNETIC FIELDS	CO1	Able to state and apply the Coulombs Law and Gauss's law to find the Electric filed intensity.
	CO2	To compute capacitance of different configurations and to analyze the behaviour of dielectrics at different boundary conditions.
	CO3	An ability to state and apply the Biot-Savart law and Ampere's circuit law to find the Magnetic field intensity.
	CO4	Gains the knowledge on applying Lorenz force equation and determination of self inductance and mutual inductances for different configurations.
	CO5	To list Faraday's laws and to Modify the Maxwell's equations for time varying fields.
POWER SYSTEMS – II	CO1	Solve line parameters for different transmission line conductor configurations.
	CO2	Analyze the performance of short, medium and long transmission lines through efficiency and regulation.
	CO3	Analyze electrical transients in power systems and concepts of travelling waves on transmission lines.
	CO4	Classify the insulators and summarize the issues for better string efficiency.
	CO5	Explain basics of corona, sag, tension calculations and other effects arise in transmission lines.
ELECTRICAL MACHINES-III	CO1	Describe the construction and working principle of various types of 3-phase induction motor.
	CO2	Summarize different techniques related to speed control of 3-phase induction motor.
	CO3	Outline different types of Alternators and their performance criteria.
	CO4	Identify different types of synchronous motors; interpret their performance under different load conditions.
	CO5	Recognize areas of application of synchronous and induction machines
CONTROL SYSTEMS	CO1	Able to understand basic components of feedback control systems; formulate mathematical models of physical systems and represent them in block diagrams and signal flow graphs.
	CO2	Able to understand the time- domain specifications; Analyze first and second order control systems in time domain;
	CO3	Able to understand the concepts of stability; Analyze stability of the system from transfer functions approach and graphical methods.
	CO4	Able to Design controllers, compensators for improve the performance specifications.
	CO5	Able to Represent physical systems in state space form and analyze them.

SELF-STUDY COURSE-I	CO1	Acquires ability to locate sources of information
	CO2	Acquires ability to filter and select relevant information
	CO3	Apply information to real world problems and solve them.
ELECTRICAL MACHINES LAB – I	CO1	Analyze the performance of DC motor under loaded and unloaded conditions.
	CO2	Analyze the characteristics of DC generator
	CO3	Determine the critical field resistance and critical speed of DC Generator
	CO4	Determine the efficiencies of DC Series and Shunt generators
	CO5	Examine various speed control methods of DC shunt motor.
ELECTRICAL CIRCUIT ANALYSIS LAB	CO1	Can Understand and verify the network theorems.
	CO2	Understood the Locus diagram of RL &RC circuits.
	CO3	Understood the Series & Parallel resonance, importance of Quality of factor.
	CO4	Know the Calculation of two port network parameters for a given network.
	CO5	Able to measure active power for Star & Delta connected loads.
CONTROL SYSTEMS LAB	CO1	Students can predict transfer function and implementation of a physical dynamical system by a linear time invariant ordinary differential equation.
	CO2	Students can examine electrical modeling of a second order system and analyze the under- damped, over-damped and critically damped cases.
	CO3	Students can interpret the effects of poles and zeros location in the s-plane on the transient and steady state behavior.
	CO4	Students can measure the characteristics of Servo-Motor.Students can design Lead, Lag and Lag-Lead series compensator on a second order system.
POWER SYSTEMS – II	CO1	Solve line parameters for different transmission line conductor configurations.
	CO2	Analyze the performance of short, medium and long transmission lines through efficiency and regulation.
	CO3	Analyze electrical transients in power systems and concepts of travelling waves on transmission lines.
	CO4	Explain the basics of corona, sag and other effects arise in transmission lines.
	CO5	Classify the insulators and summarize the issues for better string efficiency.
ELECTRICAL MACHINES – III	CO1	Understand the construction and principle of operation of synchronous machines.
	CO2	Evaluate performance characteristics of synchronous generator.
	CO3	Analyze the effects of excitation and mechanical input on the operation of synchronous generators.

	CO4	Analyze the effects of excitation and load conditions on the operation of synchronous motor.
	CO5	Understand the construction and principle operation of single phase induction motors and analyzes speed torque characteristics of single phase induction motors.
ELECTRICAL MEASUREMENTS	CO1	Classify various analog instruments and understand their principle of operation.
	CO2	Understand the operation of C.Ts and P.Ts and also able to measure the active and reactive powers
	CO3	Tell about the measurement of energy, P.f. in the power system using energy meter and power factor meters respectively
	CO4	Evaluate different methods of measuring R,L,C parameters in an electric network
	CO5	Understand the principle, operation and applications of potentiometer, flux meter and ballistic galvanometer.
LINEAR AND DIGITAL IC APPLICATIONS	CO1	Outline the characteristics of OP-AMP.
	CO2	Acquire insight into different applications of OP-AMP.
	CO3	Design filter circuits using OP-AMP and employ 555 IC for generating waveforms.
	CO4	Analyze the operation of different ADCs and DACs and classify different integrated circuit families.
	CO5	Analyze and design various types of combinational and sequential circuits.
PULSE AND DIGITAL CIRCUITS	CO1	Understand the outputs of low pass and high pass filters for different inputs.
	CO2	Understand the differences between clippers and clampers and related theory.
	CO3	Understand the switching characteristics of transistor and how to design the bi stable multi vibrator.
	CO4	Design the mono stable and Astable multi vibrator and Schmitt trigger.
	CO5	Know how time based generators are work and their theory regarding to sampling gates.
SIGNALS AND SYSTEMS	CO1	Characterize and analyze the properties of continuous time (CT) and discrete time (DT) signals and systems.
	CO2	Describe continuous time signal in the frequency domain using Fourier series (FS).
	CO3	Calculate continuous Fourier transform of a signal in the frequency domain.
	CO4	Determine the Laplace transform of continuous time signal.
	CO5	Compute the Z- transforms of discrete time signal and analyzes differential system.
ELECTRICAL MACHINES LAB – II	CO1	Explain testing and experimental procedures on different types of electrical machine.

	CO2	Prepare laboratory setup (circuits) with proper connections on electrical transformers and AC machines.
	CO3	Analyze the performance of induction motors and synchronous machines.
	CO4	Determine efficiency and regulation of single phase transformers and single phase motors.
	CO5	Analyze possible causes of discrepancy in comparison to theory.
ELECTRICAL MEASUREMENTS LAB	CO1	Evaluate the percentage error in different meters.
	CO2	Examine the calibration of ammeter and volt meter by using DC potentio meter.
	CO3	Measure the active and reactive powers.
	CO4	Design multivibrators, Voltage regulators
	CO5	Determine the choke coil parameters
INTELLECTUAL PROPERTY RIGHTS AND PATENTS	CO1	Intellectual property rights, cyber law, transfer of rights, trade mark claim, trade mark maintenance, copy right principles ,copy right ownership could be applied in professional life.
POWER SYSTEMS-III	CO1	Understand the working of different types of circuit breakers and select the suitable circuit breaker for given application in power system.
	CO2	Apply the various principles of analog protection techniques to power systems.
	CO3	Select the suitable protection schemes for Generator & Transformer.
	CO4	Select the suitable protection schemes for Feeder and Bus – Bar.
	CO5	Evaluate the influence of over voltages and analyze the different grounding techniques at different locations in a power system.
MANAGERIAL ECONOMICS AND MANAGEMENT SCIENCES	CO1	Recognize managerial economics skills to the solution of engineering problems.
	CO2	Explain the cost and production theories in engineering problems.
	CO3	Explore and develop the management qualities.
	CO4	Enhance the problem solving skills in various business areas.
	CO5	Evaluate the future threats and application theories.
POWER ELECTRONICS	CO1	Distinguish between different types of power semiconductor devices and their characteristics.
	CO2	Evaluate the performance of single Phase controlled converters with different loads.
	CO3	Describe the performance of three Phase controlled converters with different loads.
	CO4	Explain the operation of AC voltage controllers and Cyclo-converters.
	CO5	Analyze and evaluate the operation of DC –DC Choppers and inverters

COMPUTER ORGANIZATION AND ARCHITECTURE	CO1	List the different components of the computer system, their functions and their Inter connections.
	CO2	Distinguish the various instructions formats that the processor follows.
	CO3	Explain the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit, and how control unit generates control signals.
	CO4	Explore how the memory sub system to stores programs and data in an efficient manner based on design.
	CO5	Discriminate various pipelining techniques and compare array & multiple processors.
UNIX AND SHELL PROGRAMMING	CO1	Identify the importance and the numerous features of Unix Operating System.
	CO2	Describe the organization of file system and their types.
	CO3	Execute the all commands in Bourne shell Linux environment in interactive manner.
	CO4	Relate the most fundamental Korn shell concepts and features using scripts.
	CO5	Apply the advanced practices in Interactive C shell using scripts.
H.V.D.C. TRANSMISSION	CO1	Understand the basics of HVDC Transmission systems, Learning about advantages and disadvantages of DC with AC Transmission. To have Knowledge about the Modern trends in HVDC Transmission.
	CO2	Understand the analysis of HVDC converters and characteristics of 6 and 12 pulse converters with and without overlapping.
	CO3	Understand the converter control characteristics, Various controlling methods of converters such as firing angle, current and extinction angle control. Learn the converter faults and their protection schemes.
	CO4	Understand generation of harmonics, its adverse effects and also the design of filters for harmonic elimination. Learn about Multi terminal DC systems.
EXTRA HIGHVOLTAGE TRANSMISSION	CO1	Students are able to understand the basics of EHV AC transmission systems, Electrostatics and potential relations in conductors, Surface voltage gradient on conductors Effects of Corona and Travelling waves, Understand Electro static fields and Voltage control.
POWER SYSTEMS LAB	CO1	Detect the fault locations in underground cables.
	CO2	Analyze performance characteristics of relays.
	CO3	Analyze the performance characteristics of photo voltaic system and also analyze performance characteristics of Fuse and miniature circuit breaker.
	CO4	Evaluate the parameters and performance of a long transmission lines and gain the Knowledge on Ferranti effect.
	CO5	Describe the series and shunt compensation in transmission lines.

POWER ELECTRONICS LAB	CO1	Observe the behavior of semiconductor devices operated as power switches.
	CO2	Classify different types of firing circuits for thyristors.
	CO3	Analyze the concepts of commutation circuits.
	CO4	Analyze power electronics circuits such as AC/DC and DC/DC converters.
	CO5	Draw the different output wave forms of a static voltage regulator and Cyclo-Converter.
INDUSTRIAL AUTOMATION LAB	CO1	Describe about PLC, ladder logic, Latches, timers, counters and SCADA monitoring.
	CO2	Draw the ladder logic diagram for Boolean logic, timers, counters and monitor with SCADA.
	CO3	Draw the ladder logic diagram for timers and counter and monitor with SCADA
	CO4	Draw the ladder latching logic diagram for counters and timers.
	CO5	Develop ladder logic for traffic signal Control and monitor with SCADA and describe variable frequency drive based induction motor operation for using keypad.
SELF STUDY COURSE-II	CO1	Demonstrate in-depth knowledge on a specialized topic by reviewing relevant literature.
	CO2	Analyze and synthesize information on the selected topic.
	CO3	Apply skills to explore applications in emerging rates.
	CO4	Develop independent learning good communication skills for proper execution.
	CO5	Develop the skills of report writing and stage presentation.
POWER SEMI CONDUCTOR DRIVES	CO1	Choose their electric drive system based on their applications. And analyze any type of 1Φ & 3Φ control converter fed to DC motors.
	CO2	Understand the concept of single and multi quadrant drives including motoring and braking modes, and the applications of dual converters.
	CO3	Analyze chopper fed DC Drives.
	CO4	Examine the stator side control of induction motor.
	CO5	Illustrate the concepts of rotor side control of induction motor and speed control of synchronous motor.
POWER SYSTEM ANALYSIS	CO1	Compute the per unit values of system and formulate Y_{bus} for a given power system network
	CO2	Calculate the load flows in a power system using various numerical methods.
	CO3	Compute Zbus for a given power system network and analyze symmetrical fault calculation.
	CO4	Solve an un-balanced three phase network by using symmetrical components and analyze a power system under fault conditions.
	CO5	Analyze the steady state and transient stabilities.

POWERSYSTEM OPERATION AND CONTROL	CO1	Explain how the optimal allocation of total load among the generation units is done with and without losses.
	CO2	Solve Unit commitment problem using dynamic programming technique for a given power system
	CO3	Analyze the load frequency control (LFC) and have knowledge on steady state and dynamic analysis of single area power system with and without integral control.
	CO4	Design the block diagram model for a two area power system.
	CO5	Explain different reactive power compensation techniques of transmission line.
MICROPROCESSORS AND MICROCONTROLLERS	CO1	Recognize and interpret the microprocessor and microcontroller based system.
	CO2	Write assembly language programs using 8086 processor.
	CO3	Understand the concepts of advanced micro process i.e. 80386, 80486.
	CO4	Know the concepts of interfacing devices.
	CO5	Understand the basics of 8051 micro controller.
HIGH VOLTAGE ENGINEERING	CO1	Read the terms and numerical methods used in High Voltage Technology.
	CO2	Discuss different breakdown mechanisms in dielectrics.
	CO3	Analyze the concept of Generation and measurement of High Voltage, High Current and Impulses.
	CO4	Read the non-destructive test techniques in High Voltage Engineering.
	CO5	Identify the industrial applications of high voltage engineering.
ELECTRICAL MACHINE DESIGN	CO1	Be able to estimate number of conductors, slots, conductor dimension and slot dimension for DC machine based on given specifications.
	CO2	Be able to design field system, interpoles of a DC machine
	CO3	Learn how to calculate the cross section of core and yoke, number of cooling tubes, resistance,leakage reactance, losses and efficiency of a transformer.
	CO4	Learn how to design stator and rotors for squirrel cage and wound rotor induction motors
	CO5	Be able to explain the effect of Short-circuit ratio on synchronous machine performance
ARTIFICAL NEURAL NETWORKS AND FUZZY LOGIC	CO1	To expose the students to the concepts of feed forward neural networks.
	CO2	To provide adequate knowledge about feedback neural networks.
	CO3	To teach about the concept of fuzziness involved in various systems. To provide adequate knowledge about fuzzy set theory.

	CO4	To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
	CO5	To provide adequate knowledge of application of fuzzy logic control to real time systems
DATABASE MANAGEMENT SYSTEMS	CO1	Differentiate Database Systems from File Systems and Define the Terminology, Features, Classifications, Characteristics embodied in Database Systems.
	CO2	Interpret, Design and Implement an E-R Model.
	CO3	Create/Modify the structure and write optimized SQL Queries to extract and modify information from Tables or Views.
	CO4	Apply proper Techniques such as Normalization and analyze the applicability of a specific normal from in designing a Database.
	CO5	Compare various indexing, Hashing and File Organization Techniques.
	CO6	Explain broad range of database management issues including data integrity, Concurrency recovery and security.
AIR QUALITY MANAGEMENT	CO1	Able to solve air pollution problems of industries
	CO2	Able to create awareness among the public on the effects of air pollution at local level as well as global level.
	CO3	Able to manage the ambient air quality by maintaining emission standards.
	CO4	Able to get successful employment in organizations working for the protection of environmental
	CO5	Able to design air pollution control equipments for industries and other polluting sources.
CYBER LAWS	CO1	Have comprehensive information about security policies, establishing necessary organizational processes /functions for information security and will be able to arrange necessary resources.
	CO2	Understand, analyze and work on activities of fraud prevention, monitoring, investigation, reporting.
	CO3	Differentiate among the models, architectures, challenges and global legal constraints of secure electronic commerce technologies used to ensure transmission, processing and storage of sensitive information.
	CO4	Have knowledge of cyber law and ethics.
	CO5	Evaluate the interaction and relative impact of human factors, processes and technology in cyber law infrastructures.
ENTREPRENEURIAL DEVELOPMENT	CO1	Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
	CO2	Understanding Entrepreneurship Development programmes in India and contents for training for Entrepreneurial competencies.
	CO3	Create appropriate business model and develop well presented business plan that is feasible for the student.
	CO4	Understanding how to manage effectively the selected business.

INDUSTRIAL SAFETY AND ENIVRONMENT	CO1	Attain the basic fundamentals safety management
	CO2	Understand the safety various industrial safety acts
	CO3	Acquire basic knowledge of different type of industrial hazards
	CO4	Understand the concepts of environmental safety
MICRO ELECTRO MECHANICAL SYSTEMS	CO1	To understand various MEMS fabrications processes including additive, subtractive, patterning, material modification processes and mechanical steps.
	CO2	To understand workings of MEMS mechanical and thermal sensors and actuators
	CO3	To understand mechanisms of MEMS magnetic sensors and actuators and Micro-fluidic devices
	CO4	To understand mechanisms of MEMS optical and RF devices.
	CO5	To be exposed to MEMS simulation softwares, Multiscale simulations, CNT and NEMS.
OPTIMIZATION TECHNIQUES	CO1	Should be able to solve linear multivariable optimization using linear programming and perform sensitivity analysis.
	CO2	Should be able to solve single-variable, non-linear, unconstrained optimization problems
	CO3	Should be able to solve geometric programming optimization problems using standard techniques for each case.
RENEWABLE ENERGY	CO1	Discuss about solar radiation and solar energy.
	CO2	Classify different types of wind mills
	CO3	Describe the bio mass and geo thermal energy.
	CO4	List out different sources of ocean energy.
	CO5	Examine the concept of direct energy conversions
ADVANCED MATERIALS	CO1	Understand the need and explain different types of composite materials.
	CO2	Summarize the various methods for manufacturing of the composite materials.
	CO3	Distinguish between the properties and uses of different reinforcement fibers.
	CO4	Explain the principles, types and applications of different functionally graded materials and shape memory alloys.
	CO5	Outline the evolution, history, applications and impact of nanotechnology.
TOTAL QUALITY MANAGEMENT	CO1	Develop an understanding on quality management philosophies and frameworks.
	CO2	Understand the fundamental principlesof total quality management.
	CO3	Choose approximate statistical techniques for improving processes.
	CO4	Develop in-depth knowledge on various tools and techniques of quality management.
	CO5	Know what cultural transformation is necessary for successful implementation of total quality practices with his/her organization.

MICROPROCESSORS AND MICROCONTROLLER LAB	CO1	Compute assembly language programs using arithmetic instructions.
	CO2	Write assembly language programs using string instructions.
	CO3	Compare and analyze the various interfacing techniques with 8086 and develop the programs.
	CO4	Interface 8051 ports with various peripherals and develop programs.
	CO5	Develop an assembly language program to read the 8051 timer in different modes.
ELECTRICAL SIMULATION LAB WITH SIMULINK	CO1	Correlate with the basic concepts and properties of electrical circuits and networks.
	CO2	Practice computer skills (ORCAD PSPICE and Capture) for the analysis and design of circuits.
	CO3	Demonstrate proficiency in the use of high-performance engineering modeling and analysis of software(MATLAB and SIMULINK) for control system analysis and design in this course and for subsequent Engineering practice.
	CO4	Develop the simulation of power electronic circuits with different loads.
	CO5	Observe several concepts and procedures learned in power system and electrical machines, their modeling and analysis.
UTILIZATION OF ELECTRICAL ENERGY	CO1	Be able to select an appropriate motor for given application.
	CO2	Gain insight into different electrical heating and welding techniques.
	CO3	Be able to understand basic principles of light control and design lighting schemes.
	CO4	Be able to differentiate existing electric traction system in India.
	CO5	Acquire knowledge to calculate tractive effort, power, specific energy consumption for given run.
DIGITAL CONTROL SYSTEMS	CO1	Students can summarize different types of signals.
	CO2	Students can operate the Z- transforms and inverse Z transforms.
	CO3	Students can develop state model and stability analysis of digital control systems.
	CO4	Students can test controllability and observebility in state space analysis.
	CO5	Students can design discrete time control system by conventional methods.
ADVANCED CONTROL SYSTEMS	CO1	Compute solution of state equation and estimate the controllability and observablity
	CO2	Design the observers for pole placement

	CO3	Apply liapunov theory and analyze the stability
	CO4	Associate the functions of adaptive control with their applications
	CO5	Distinguish the optimal control problems
ELECTRICAL DISTRIBUTION SYSTEMS	CO1	Classify types of Loads and develops relationship between load factor and loss factor.
	CO2	Compute distribution substation rating, to list the derived through optimal substation location.
	CO3	Determine voltage drop and power loss calculations for Radial 3-phase balanced networks.
	CO4	List the types of faults and protection devices, to explain the purpose of protection device.
	CO5	Explain the types of power factor improvement, Also he will determine the Capacitor (KVAR) rating for improving the power factor.
INSTRUMENTATION	CO1	Be able to generalize the monitoring and analysis of any physical system and its control.
	CO2	Be able to describe different testing signals.
	CO3	Be able to explain the different types of transducers, digital voltmeters.
	CO4	Be able to illustrate the operation of signal analyzers.
	CO5	Be able to summarize the process of measurement of non-electrical quantities.
OPERATIONS RESEARCH	CO1	Can solve the optimum value of objective function of Linear Programming problem.
	CO2	Can construct and solve for (minimum value) of a mathematical problem under different transportation problem and assignment problem. Also, find the solution of job sequencing problem.
	CO3	Can compute the value of the game under optimal strategies.
	CO4	Can identify the cost of the inventory theory and solve the inventory problem.
	CO5	Can calculate the optimum solution of Dynamic programming problem using Bellman's principle of optimality. Also solve inventory and job sequencing problem using simulation technique.
Digital Signal Processing	CO1	Discriminate the discrete systems based on their basic properties.
	CO2	Determine the frequency response of different signals using DFT and FFT.
	CO3	Design FIR and IIR filters using different techniques.
	CO4	Use up and down sampling of signals in multirate signal processing.
	CO5	Identify the architecture of DSP processor and understand the function of each element.
VLSI DESIGN	CO1	Identify different MOS technologies for VLSI design.
	CO2	Distinguish characteristics of CMOS and BICMOS.
	CO3	Able to draw the stick & layout diagrams of various circuits.
	CO4	Differentiate PLD's for various VLSI circuits.
	CO5	Can write HDL program for different circuits.

POWER QUALITY MANAGEMENT	CO1	Students will be examine different power quality issues and prepared to take up prospective projects assignment.
	CO2	Students will be describe power distribution protection techniques and its impact on voltage quality.
	CO3	Students will be plan to trained the work for improvement and betterment of power quality.
	CO4	Students will be distinguish basic harmonic phenomena, methods for dealing with harmonic distortion.
	CO5	Students will be read theoretically and practically for monitoring of power quality.

DEPARTMENT OF CIVIL - A.Y: 2017-18

Program Outcomes

PO1 Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 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.

PO3 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.

PO4 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.

PO5 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.

PO6 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.

PO7 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.

PO8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 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.

PO11 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.

PO12 Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Program Specific Outcomes

PSO1 Analyze, design and execute the civil engineering structures with good knowledge in engineering, mathematics & basic sciences.

PSO2 Survey, map, plan & layout of infrastructures viz. canals, roads, etc. and apply knowledge of environmental & geotechnical engineering.

PSO3 Acquire knowledge of various techniques, skills and engineering tools required for civil engineering structures including all types of buildings, irrigation structures, highways, railways, docks & harbors etc.

COURSE OUTCOMES

COURSE		Description
English	CO1	Students will be able to read and comprehend seen and unseen passages and answer questions based on them.
	CO2	Students will be able to interpret the content of a passage and state their perspective.
	CO3	Students will be able to understand words and their meanings, and know prefixes, suffixes, analogies, synonyms, antonyms and one word substitutes.
	CO4	Students will be able to use articles, quantifiers, gerunds, infinitives, present participles and tenses appropriately.
	CO5	Students will be able to write sentences, paragraphs, formal letters, emails, short essays on any given topic.
Engineering Mathematics-I	CO1	Solve the 1st order differential equations by identifying the suitable method.
	CO2	Identify and solve a 2nd and higher order differential equations and perform simple applications in Engineering.
	CO3	Estimate the maxima and minima of two variable functions under different constraints.
	CO4	Solve a multiple integral and apply to estimate the volume and surface area of the solids.

	CO5	Calculate grad, divergence, curl; a line, surface and volume integral. To find work done, area, and volume. Apply the vector integral theorems to evaluate multiple integrals.
Building Materials and Construction	CO1	Describe the physical properties of construction materials.
	CO2	Explain the usage of construction materials
	CO3	Describe construction practices of masonry, water proofing and foundation works.
	CO4	Describe about doors, windows, ventilators, floors, stairs, roofs etc. and prefabricated elements
	CO5	Describe about finishing works, scaffolding, shoring, under pinning and form work
Engineering Chemistry	CO1	Different moulding techniques of plastic material.
	CO2	Determine total hardness of water by EDTA method.
	CO3	Design the metallic materials to prevent corrosion.
	CO4	Apply suitable lubrication mechanisms for various machinery parts.
	CO5	Demonstrate the working of Photovoltaic cell.
Engineering Drawing	CO1	Draw lettering, dimensioning, scales, geometric constructions and engineering curves
	CO2	Draw Orthographic Projections which include points and lines using first and third angle projections
	CO3	Draw Projections of planes which include perpendicular and inclined planes
	CO4	Draw Projections of planes which include perpendicular and inclined planes
	CO5	Convert Orthographic Projections to Isometric Projections vice versa
Computer Programming	CO1	Understand the fundamentals of C programming.
	CO2	Choose the loops and decision making statements to solve the problem.
	CO3	Implement different operations on arrays and solve problems using functions.
	CO4	Understand pointers, structures and unions.
	CO5	Implement file operations in C programming for a given application.
Engineering Chemistry Lab	CO1	Determine Dissolved Oxygen. and Turbidity of water samples.
	CO2	Explain the importance of viscosity, Flash point and Acid value of a lubricant.
	CO3	Determine the amount of acid or base by pH metric and conductometric titrations.
	CO4	Determine the hardness of various water samples.
	CO5	Operate all the instruments in the chemistry laboratory analysis.
Basic English Communication Skills Lab	CO1	Students will be able to pronounce words accurately based on the knowledge of speech sounds and use appropriate intonation patterns in speech.
	CO2	Students will be able to comprehend audio and video clips of different accents.
	CO3	Students will be able to describe / discuss / explain a given situation / context well.
	CO4	Students will be able to read and recall what they have read.

	CO5	Students will be able to understand and interpret information provided in graphs, tables etc.
Computer Programming Lab	CO1	Solve the given problem using the syntactical structures of C language
	CO2	Develop , execute and document computerized solution for various problems using the features of C language
	CO3	Design programs involving decision structures and loops.
	CO4	Implement modularity and code reusability concepts using functions.3
	CO5	To read and write C program that uses pointers, structures and files
English Communication Practice	CO1	Students will be able to use grammar appropriately in speech and writing.
	CO2	Students will be able to describe, discuss, explain and interpret a given situation / context effectively.
	CO3	Students will be able to read texts and listen to lectures and make notes on them.
	CO4	Students will be able to apply reading techniques in their other subjects.
	CO5	Students will be able to summarize, paraphrase and review a piece of writing efficiently.
Engineering Mathematics-II	CO1	Solve the algebraic and transcendental equations by identifying suitable numerical methods, estimate a linear and non-linear curve to the given data by the method of least squares, calculate the value of dependent variable for a particular x by deducing the unknown function $y = f(x)$ for an evenly or unevenly spaced points.
	CO2	Estimate the value of derivatives, evaluate the definite integrals using different numerical methods and evaluate an IVP.
	CO3	Deduce Laplace transform of different continuous functions using different properties and solve an I.V.P & B.V.P applying Laplace transform.
	CO4	Deduce the Fourier series and half range series expansions of different functions for different intervals.
	CO5	Solve a linear and non-linear 1st order partial differential equation and using method of separation of variables evaluate a wave equation & heat equation
Environmental Studies	CO1	Recognize the general issues of environment and know how to conserve the environment, speaks well again on various resources, present status and their better usage.
	CO2	Explain the interdependency of life in the ecosystem, demonstrate the structural and functional setup, classify and appraise the importance of diversity on the earth and differentiate the conservation methods.
	CO3	Examine the various types of pollutants and their impacts along with their control methods; review the different types of solid wastes, impacts and their eco friendly disposal methods.
	CO4	Translate the concept of sustainable development by green technologies, experiment on the environmental management systems for clean, green, safe and healthy environment through clean development mechanisms.

	CO5	Evaluate the changing trends of population curves among different nations, discuss how to limit the current population size, collect and compile the information to document the environmental assets
Engineering Physics	CO1	Apply the principles of optics in designing optical devices
	CO2	Outline the Principles of Lasers and Fiber Optics
	CO3	Resolve the discrepancies in classical estimates through quantum principles
	CO4	Interpret the knowledge of Magnetic Properties in Material Fabrication
	CO5	Explain the response of E-Field on Dielectric Materials to control the device performance
Engineering Mechanics	CO1	Define and solve the problems on system of forces
	CO2	Apply the concept of equilibrium on various force systems
	CO3	Illustrate laws of friction on different planes. Compute centroid and center of gravity for various planes and solids
	CO4	Calculate area moment of inertia and Mass moment of inertia
	CO5	Illustrate various problems on kinetics and kinematics
Basic Electrical & Electronics Engineering	CO1	Ability to analyze electrical circuits for both DC and AC
	CO2	Identify and Define different types of dc generators
	CO3	Ability to generalize AC machines.
	CO4	Classify different types of measuring instruments
	CO5	To outline semiconductor devices.
Engineering Physics Lab	CO1	Infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
	CO2	Apply classic experimental techniques to comprehend the Phenomenon of resonance with equipment such as sonometer, Melde's apparatus and volume resonator to measure desired properties
	CO3	Demonstrate the ability to measure properties of optical systems and design instrumentation with precision measurements to estimate error for targeted accuracy
	CO4	Illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
	CO5	Evaluate characteristics of magnetic, dielectric and semiconducting material devices
Engineering Workshop Lab	CO1	Student will be able to make various joints in the given object with the available work material.
	CO2	Student will be able to know how much time a joint will take for the assessment of time
Electrical & Electronics Engineering Lab	CO1	Analyze DC electrical circuits.
	CO2	Determine performance of DC machines.
	CO3	Interpret performance of AC Machines.
	CO4	Understand the transistor characteristics.
	CO5	Distinguish the full wave rectifier with and without filters.
Strength of	CO1	Summarize and analyze simple stresses & strains of ductile materials
	CO2	Determine the shear force and bending moments of the Simply supported, cantilever and over hanging beams under various loads

Strength of Materials-I	CO3	Assess the flexural stresses of various cross sections using simple bending theory
	CO4	Assess the shear stresses of various cross sections
	CO5	Determine slope and deflections of beams using different methods
Fluid Mechanics	CO1	Describe the physical properties of fluids and illustrate Pascal's law, Hydrostatic law and measurement of pressure.
	CO2	Compute hydrostatic forces and center of pressure on submerged plane and curved surfaces.
	CO3	Summarize concepts of fluid flows and apply equation of continuity, flow net analysis
	CO4	Illustrate Euler's, Bernoulli's, Navier-Stokes equations and Reynolds's experiment.
	CO5	Describe the concepts of closed conduit flow and demonstrate measurement of flow
Surveying	CO1	Describe basics and overview of plane surveying
	CO2	Describe about leveling and apply its knowledge in contour survey.
	CO3	Describe about theodolite and apply its knowledge in Trigonometrical leveling, Traversing etc.
	CO4	Compute areas and volumes of irregular, regular boundaries of cutting and Embankment sections
	CO5	Design and setting out of simple and compound curves.
Environmental Engineering-I	CO1	Explain about waterborne diseases, water supply analysis, water quality tests and drinking water standards
	CO2	Describe intakes and infiltration galleries in terms of quality and quantity of water. Describe and design of distribution systems with various methods including testing of pipes
	CO3	Layout and design of water treatment units like sedimentation, coagulation
	CO4	Describe and design slow, rapid, pressure filters etc.& disinfection practices
	CO5	Describe about characteristics, generation, collection & transportation of solid wastes and engineered systems for solid waste management
Engineering Geology	CO1	Extrapolate the importance of physical geology, petrology, and structural geology
	CO2	Summarize and identify various minerals
	CO3	Summarize and identify various rocks
	CO4	Classify the geological structures associating with rocks
	CO5	Outline various geophysical investigations
Matrices and Applications	CO1	Calculate the rank of a matrix and solve linear system of equations by different methods.
	CO2	Calculate eigen values, eigen vectors of real and complex matrices, apply Cayley's Hamilton theorem to calculate the powers and inverse of matrices.
	CO3	Solve Linear system of equations by LU –Factorization, Matrix Inverse, Gauss seidal Method, Eigen Values by Iteration (Power Method), Tridiagonalization and QR-Factorization.
	CO4	Deduce quadratic to canonical form by different methods.

	CO5	Compute matrix operations using mat lab.
Introduction to MAT Lab	CO1	Translate mathematical methods to MATLAB code
	CO2	Generalize results and represent data visually
	CO3	Student should be able to apply computer methods for solving a wide range of engineering problems.
	CO4	Students should be able to utilize computer skills to enhance learning and performance in other engineering and science courses.
	CO5	And finally, students should be able to demonstrate professionalism in interactions with industry.
Fundamentals of Material Science	CO1	Gain thorough knowledge in engineering materials and their structures.
Introduction of Electronic Measurement	CO1	Identify electronic instruments, their Characteristics and use.
	CO2	Describe various signal generators, wave analyzers for distortion measurements.
	CO3	Measure Amplitude, Frequency and Phase of various signals using different types of CRO's.
	CO4	Design the AC bridges for measurement of resistance, inductance, capacitance for frequency changes.
	CO5	Explain various types of transducers and their applications for measuring non- electrical parameters.
UNIX Utilities	CO1	Identify and use UNIX utilities to create and manage simple file processing operations, organize directory structures with appropriate security.
	CO2	Effectively use the UNIX system to accomplish typical personal, office, technical, and software development tasks.
	CO3	Monitor system performance and network activities.
	CO4	Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files.
	CO5	Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines.
	CO6	Develop shell scripts to perform more complex tasks.
IT Systems Management	CO1	be able to describe the business value and processes of ICT services in an organisation and apply that knowledge and skill with initiative to a workplace scenario
	CO2	be able to analyze and evaluate the impact of new and current ICT services to an organisation;
	CO3	be able to describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organisation;
	CO4	Characteristics of the network that affect user satisfaction.
	CO5	Be able to define, track, and maintain data and data resources.
Strength of Materials Lab	CO1	Determine tensile, compressive, bending and shear strength of the construction materials by using UTM.
	CO2	Determine deflection and modulus of elasticity of simply supported, cantilever & continuous beams made up of steel & wood
	CO3	Compute hardness of mild steel using Brinel and Rockwell hardness testing machine
	CO4	Compute torsional rigidity of mild steel using torsion testing machine

	CO5	Compute stiffness of the spring by spring testing machine and impact strength of mild steel by using Izod &Charpy testing machine
Surveying Lab-I	CO1	Determine area, chaining across obstacles and prepare outline of residential building using chain survey
	CO2	Determine distance between two inaccessible points and area of closed traverse by using prismatic compass
	CO3	Draw accessible and inaccessible objects by plane table survey using radiation, intersection methods, two-point and three-point problems
	CO4	Determine reduced levels for L.S and C.S of road profiles using dumpy or auto level
	CO5	Draw contouring by taking R.Ls using leveling instrument
Engineering Geology Lab	CO1	Identify minerals like Muscovite, Biotite, Asbestos etc. from physical tests
	CO2	Identify rocks like Shale, Limestone, Gneiss, Schist etc. from megascopic studies
	CO3	Interpret sections for geological maps showing tilted beds, faults, unconformities etc
	CO4	Draw sections for geological maps showing tilted beds, faults, unconformities etc.
	CO5	Compute thicknesses, dip and strike of structural geological beds
Professional Ethics and Morals	CO1	Realize the importance of human values.
	CO2	Understand that excessive desires of the mind make a person unethical and restless, while fewer desires lead to peace and professional progress.
	CO3	Assess different types of risks involved in unethical practices. Know various means of protesting against unethical practices.
	CO4	Assess the benefits of restraining from unethical practices like bribery, extortion, nepotism, nexus between politicians and industrialists.
	CO5	Summarize case studies of ethical violations in Chernobyl meltdown, Challenger disaster, Ford Pinto design, Kingfisher Airlines financial misappropriation.
Complex Variables and Statistical Methods	CO1	Can identify an analytic function, harmonic function; find harmonic conjugate function via Cauchy-Riemann equations.
	CO2	Can identify and classify zeros and singular points of a function, calculate the residues by residue theorem and evaluate integrals using the Cauchy Integral formulae.
	CO3	Can find Laurent series expansion of complex functions for different region of convergence and calculate the residues by Laurent Series.
	CO4	Can apply Baye's theorem to solve industry related problems, recognize where the use of certain standard probability distributions would be appropriate.
	CO5	Can use appropriate tabular and graphical formats for displaying univariate (bivariate) data sets and carry out correlation, regression analysis.
Hydraulics and	CO1	Describe various methods of dimensional analysis
	CO2	Analyze and design open channels for different flows.
	CO3	Determine hydrodynamic forces of jets on various vanes.

Hydraulic Machinery	CO4	Summarize concepts of hydropower installation, turbines and calculate design parameters of turbines with performance characteristics.
	CO5	Describe and analyze centrifugal pumps.
Structural Analysis-I	CO1	Analyze simply supported and cantilever pin jointed plane frames using various methods.
	CO2	Analyze the three hinged arches considering effect of temperature.
	CO3	Analyze propped cantilever and fixed beams for various loads.
	CO4	Analyze continuous beams by Clapeyron's theorem for different support and loading conditions
	CO5	Analyze beams for moving loads and draw influence line diagrams
Strength of Materials-II	CO1	Describe and analyze thin cylinders and spherical shells
	CO2	Describe and analyze thick cylinders and spherical shells
	CO3	Describe and analyze principal stresses and strains in members.
	CO4	Describe and analyze torsion of circular shafts.
	CO5	Define and analyze columns and struts.
Building Planning and Drawing	CO1	State about building bye laws and regulations
	CO2	Distinguish residential and public buildings
	CO3	Explain CPM and PERT with examples.
	CO4	Draw sign conventions, bonds, doors, windows, ventilators and roofs etc.
	CO5	Draw plans, sections and elevations of sloped and flat roof buildings
Transform Theory	CO1	Deduce Z- transform of discrete functions and solve their related problems.
	CO2	Find the inverse z-transforms of discrete functions using the properties and solve their related problems.
	CO3	Derive the Fourier transforms of different functions using different properties, and solve related problems.
	CO4	Deduce the Inverse Fourier transforms and Finite Fourier Transforms different functions using different properties.
	CO5	Apply Z-transform to solve difference equations and Fourier Transforms to solve Boundary value problems (Heat Conduction-Transverse Vibrations of a string-Transmission Lines).
Renewable Energy Sources	CO1	Define different kind of solar radiation
	CO2	Utilize different methods of collection of solar energy and storage of solar energy
	CO3	Classify different types of wind mills and biogas digesters
	CO4	Classify different types of geothermal energy sources and utilize different types of extracting techniques
	CO5	Distinguish different kinds of direct energy conversion techniques
Principles of Mechanical Measurements	CO1	Define basic principles of measurement systems, and describe dynamic performance characteristics and sources of error.
	CO2	Measure pressure and flow using appropriate instruments
	CO3	Measure temperature using different transducers.
	CO4	Measure Displacement and Acceleration using appropriate devices.
	CO5	Measure force, torque speed and power using suitable instruments
	CO1	Analyze various types of signals and their properties

Principles of Communication	CO2	Summarize the fundamental concepts like modulation, demodulation of analog modulation schemes.
	CO3	Discriminate the various pulse modulation schemes and multiplexing techniques.
	CO4	Summarize the different types of Digital communication systems
	CO5	Explain the basic concepts of information theory
Introduction to JAVA	CO1	Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
	CO2	Identify classes, objects, members of a class and the relationships among them needed for a specific problem
	CO3	To demonstrate the ability to understand and use Exception handling and file handling mechanism
	CO4	Arrange the concrete and abstract classes in an appropriate hierarchy.
	CO5	Develop efficient Java applets and applications using OOP concept
Introduction to Python	CO1	Be fluent in the use of procedural statements — assignments, conditional statements, loops, method calls — and arrays.
	CO2	Identify or characterize or define a problem.
	CO3	Design, code, and test small Python programs that meet requirements expressed in English. This includes a basic understanding of top-down design.
	CO4	Understand the concepts of object-oriented programming as used in Python: classes, subclasses, properties, inheritance, and overriding.
Advanced English Communications Skills Lab	CO1	Students will be able to state meanings, synonyms, antonyms, analogies, idioms, phrases, one word substitutes, word roots, prefixes and suffixes for words in general.
	CO2	Students will be able to present and interpret data on select topics using pre-existing slides.
	CO3	Students will be able to contribute proactively and extrapolate in group discussions.
	CO4	Students will be able to prepare Résumé / CV and face interview.
	CO5	Students will be able to develop communication skills by playing different roles.
Fluid Mechanics Lab	CO1	Calibrate Orifice
	CO2	Calibrate Venturimeter
	CO3	Calibrate V Notch and Trapezoidal Notch
	CO4	Calibrate Mouth pieces
	CO5	Calibrate Orifice and Venturimeter
Surveying Lab-II	CO1	Compute horizontal angle by repetition & reiteration methods and measure the distance between two inaccessible points using theodolite
	CO2	Compute heights and distances between two inaccessible points using trigonometric and tachometric principles
	CO3	Generate simple curves in the field by using theodolite
	CO4	Determine distance, gradient, height between two inaccessible points, area, remote height, and perform traversing & contouring by total station
	CO5	Create way points and routes using GPS
	CO1	Acquires ability to locate sources of information.

Self Study Course-I	CO2	Acquires ability to filter and select relevant information
	CO3	Apply information to real world problems and solve them.
	CO4	Apply latest examples on presentations
	CO5	Acquires ability to give presentation in any programs
Building Planning and Drawing	CO1	State about building bye laws and regulations
	CO2	Distinguish residential and public buildings
	CO3	Explain CPM and PERT with examples.
	CO4	Draw sign conventions, bonds, doors, windows, ventilators and roofs etc.
	CO5	Draw plans, sections and elevations of sloped and flat roof buildings
Transportation Engineering	CO1	Explain highway development and planning.
	CO2	Describe and design of highway geometric elements
	CO3	Explain basic parameters of traffic, parking studies and its characteristics, road accident analysis
	CO4	Describe traffic regulatory signs and design of signals by various methods.
	CO5	Design At grade intersections and grade separated intersections
Design and Drawing of Concrete Structures-I	CO1	Describe working stress method and design of beams including detailing
	CO2	Explain concepts of limit state method and design of beams including detailing
	CO3	Design of Flexure, Shear, Torsion and Bond of beams including detailing by limit state method
	CO4	Design of Compression Members by limit state method including detailing
	CO5	Design of slabs by using limit state method including detailing
Geotechnical Engineering-I	CO1	Explain soil formation, volume-weight relations, index properties and classification of soils.
	CO2	Describe permeability and seepage of soils
	CO3	Compute stress distribution in soils with different loading conditions using Boussinesq's and Wester gaard's theories
	CO4	Describe compaction and consolidation of soils
	CO5	Determine shear strength of soil by various theories and laboratory tests
Structural Analysis-II	CO1	Analyze two hinged arches for various loads and building frames by approximate methods.
	CO2	Analyze beams and frames by slope deflection method
	CO3	Analyze beams and single bay portal frames by moment distribution method
	CO4	Analyze continuous beams and single bay portal frames by Kani's and flexibility method
	CO5	Analyze beams and single bay portal frames by stiffness method
Surveying Lab-II	CO1	Compute horizontal angle by repetition & reiteration methods and measure the distance between two inaccessible points using theodolite
	CO2	Compute heights and distances between two inaccessible points using trigonometric and tachometric principles
	CO3	Generate simple curves in the field by using theodolite

	CO4	Determine distance, gradient, height between two inaccessible points, area, remote height, and perform traversing & contouring by total station
	CO5	Create way points and routes using GPS
Computer Aided Engineering Drawing Practice	CO1	Draw points, lines, curves, polygons, dimensioning etc., using Drawing tools using AutoCAD
	CO2	Draw 2D wire framing models, 3D wire framing models using object selection commands, utility commands etc. using AutoCAD.
	CO3	Draw isometric projections, Orthographic projections and solids using AutoCAD.
	CO4	Draw plan, elevation and sections of buildings using AutoCAD
	CO5	Draw 3D drawings of buildings using AutoCAD
Transportation Engineering Lab	CO1	Determine coarse aggregate impact, crushing, abrasion and attrition values using different laboratory testing machines
	CO2	Determine specific gravity, water absorption, elongation and flakiness index values of coarse aggregates
	CO3	Determine viscosity, flash and fire point and softening point of bitumen in laboratory
	CO4	Determine ductility and penetration of bitumen using ductility testing machine & standard penetrometer respectively
	CO5	Determine stripping value of bitumen in laboratory
Self Study Course-II	CO1	Acquires ability to locate sources of information.
	CO2	Acquires ability to filter and select relevant information
	CO3	Apply information to real world problems and solve them.
	CO4	Apply latest examples on presentations
	CO5	Acquires ability to give presentation in any programs
Design of Concrete Structures-II	CO1	Design different types of footings by limit state method
	CO2	Design different types of slabs by limit state method
	CO3	Design different types of bridges subjected to IRC loads by limit state method
	CO4	Design of piles and pile caps by limit state method
	CO5	Design different types of water tanks by working stress method
Design of Steel Structures	CO1	Describe and design of welded connections including detailing
	CO2	Design of beams including detailing
	CO3	Design of Tension members and compression members including detailing
	CO4	Design of gantry girder including detailing
	CO5	Design of plate girder including detailing
Geotechnical Engineering-II	CO1	Summarize soil exploration and field tests
	CO2	Analyze earth slope stability using various methods
	CO3	Determine earth pressure by various theories
	CO4	Determine safe bearing capacity and settlement of soils
	CO5	Determine load carrying capacity of piles by various methods
Transportation Engineering-II	CO1	Design of pavement using CBR, IRC and AASHTO methods
	CO2	Explain construction, maintenance and drainage of various pavements
	CO3	Illustrate highway economics and finance
	CO4	Describe the components, layouts and theories of permanent way
	CO5	Design and layout of airports

Water Resources Engineering	CO1	Explain and analyze engineering hydrology
	CO2	Explain and analyze hydrographs, flood forecasting methods
	CO3	Describe and compute ground water parameters of aquifers and explain irrigation methods.
	CO4	Explain and analyze soil-water-plant relationship and irrigation parameters
	CO5	Classify and Design irrigation canals using various methods
Earth Quake Rersistant Design	CO1	Explain parameters of structural dynamics, formulation of equations of motion for SDOF and MDOF systems. Determination of natural frequencies of vibration and mode shapes.
	CO2	Explain rigid base excitation and analysis of earthquakes using response spectra
	CO3	Compute seismic loads using response spectrum and seismic coefficient methods as per IS:1893 – 2002 (Part-I)
	CO4	Explain the engineering seismology
	CO5	Discuss the latest Indian Seismic codes IS:4326 and IS:13920-1993 provisions for ductile detailing of R.C buildings, Beam, column and joints.
Industrial Water and Waste Water Management	CO1	Identify the sources of pollution and outline industrial wastes
	CO2	Discuss about the basic theories of industrial waste water management and identify the problems of joint treatment
	CO3	Discuss about industrial waste water discharges, recirculation and use of municipal waste water in industries
	CO4	Explain the manufacturing processes and design origin of liquid waste from various industries
	CO5	Explain about common effluent treatment plants (CETP) and effluent disposal methods
Traffic Engineering	CO1	Describe various characteristics and measurements of traffic
	CO2	Compute highway capacity
	CO3	Identify traffic problems, Design signals for Traffic control and regulation through various methods
	CO4	Describe effects of traffic on environment and measures to reduce
	CO5	Explain about traffic signs and road markings
Prestressed Concrete	CO1	Describe general principles and various methods of pre-stressed concrete
	CO2	Identify the losses of the prestress and analyze sections for flexure
	CO3	Design of Sections for Flexure and Shear, analyze the end blocks by different methods
	CO4	Analyze stresses and compute shrinkage of composite sections
	CO5	compute Deflections of Pre-stressed Concrete Beams
Drawing of Concrete and Steel Structures	CO1	Draw reinforcement detailing of flat slab, combined footing and raft foundation
	CO2	Draw detailing of simple and compound steel beams
	CO3	Draw detailing of laced, battened, slab base and gusseted base of steel columns
	CO4	Draw detailing of steel roof trusses including particulars at joints
	CO5	Draw detailing of Plate girder including curtailment, splicing and stiffeners

STAAD Pro Lab	CO1	Analyze and design 2D RCC frames using STAAD Pro
	CO2	Analyze and design steel tabular truss using STAAD Pro
	CO3	Analyze and design 3D RCC frame using STAAD Pro
	CO4	Analyze and design retaining walls using STAAD Pro
	CO5	Analyze and design simple towers using STAAD Pro
IPR& Patents	CO1	Understand the scope of intellectual property rights.
	CO2	Understand the reasons behind the existence of intellectual property law.
	CO3	Understand the process of the historical development of intellectual property rights.
	CO4	Understand the distinct contribution of intellectual property law to the protection of human creativity, innovation, and effort.
Environmental Engineering	CO1	Explain about water supply analysis, quality and quantity of water
	CO2	Layout and design of water treatment units
	CO3	Design of distribution systems with various methods
	CO4	Describe conservancy and design of water carriage systems
	CO5	Layout and design of waste treatment units, septic tank with soak pit
Estimation and Quantity Surveying	CO1	Prepare detailed and abstract estimate of buildings
	CO2	Compute earthwork excavation for roads and canals
	CO3	Estimate the cost of the various items of civil works
	CO4	Estimate reinforcement for bar bending and prepare bar bending schedules
	CO5	Prepare Contract Documents and Valuation of buildings.
Remote Sensing & GIS Applications	CO1	Explain about Basic components of remote sensing
	CO2	Describe about Sensors, Platforms and image data characteristics
	CO3	Analyze and classify images
	CO4	Discuss about fundamental concepts of Geographic Information System
	CO5	Analyze Spatial data and explain about applications of RS and GIS
Water Resources System Planning and Management	CO1	Explain about water resources planning and management.
	CO2	Explain about linear and Dynamics programming models
	CO3	Describe Non-linear optimatization techniques
	CO4	Explain about application of simulation techniques in water resources.
	CO5	Describe Principles of Economics and Water resources management planning.
Air Pollution and Control	CO1	Explain about air pollution, classification and Effects of air pollutants
	CO2	Explain about Thermodynamics and Kinetics of Air-pollution, Computation and Control of products of combustion.
	CO3	Explain and analyze Meteorology and plume Dispersion
	CO4	Describe Control of particulates and design of control equipments
	CO5	Explain about Methods to Control of NO_x and SO_x emissions etc., and their monitoring as per standards
Ground Improvement Techniques	CO1	Illustrate different dewatering techniques for C and Ø soils and apply different grouting methods
	CO2	Explain in-situ densification methods for granular and cohesive soils at surface level and at deeper level
	CO3	Explain Methods of stabilization and Reinforced earth
	CO4	Explain about Geo synthetics and its applications

	CO5	Describe expansive soils and design of foundations.
Hydraulic Structures and Irrigation Design & Drawing	CO1	Explain about reservoir planning including problems solving
	CO2	Describe, analyze and design gravity and earth dams
	CO3	Describe, analyze and design of spillways
	CO4	Design and Drawing of Surplus weir, Tank Plug sluice and Canal gate sluice
	CO5	Design and Drawing of Notch type Canal Drop, Canal Cross regulator and Aqueduct
Air Quality and Management	CO1	Explain about air pollution including Classification of sources
	CO2	Analyze effects of air pollution and its effects on man, material and vegetation
	CO3	Explain Control of particulates and equipment design
	CO4	Explain about methods to Control of NO_2 and SO_2 emissions etc., and control measures
	CO5	Describe Ambient Air Quality Management and monitoring.
Cyber Laws	CO1	Have comprehensive information about security policies, establishing necessary organizational processes /functions for information security and will be able to arrange necessary resources.
	CO2	Understand, analyze and work on activities of fraud prevention, monitoring, investigation, reporting.
	CO3	Differentiate among the models, architectures, challenges and global legal constraints of secure electronic commerce technologies used to ensure transmission, processing and storage of sensitive information.
	CO4	Have knowledge of cyber law and ethics.
	CO5	Evaluate the interaction and relative impact of human factors, processes and technology in cyber law infrastructures.
Entrepreneur Development	CO1	Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
	CO2	Understanding Entrepreneurship Development programmes in INDIA and contents for training for Entrepreneurial competencies.
	CO3	Create appropriate business model and develop well presented business plan that is feasible for the student.
	CO4	Understanding how to manage effectively the selected business.
Industrial Safety and Environment	CO1	Explain basic Principles of Safety Management of industries
	CO2	Describe environment safety against different pollutions from industries
	CO3	Explain about occupational health and various hazards
	CO4	Analyze the concepts of environmental safety as per various acts
	CO5	Explain about international and Indian acts with regard to industrial safety
MEMS	CO1	To understand various MEMS fabrications processes including additive, subtractive, patterning, material modification processes and mechanical steps.
	CO2	To understand workings of MEMS mechanical and thermal sensors and actuators
	CO3	To understand mechanisms of MEMS magnetic sensors and actuators and Micro-fluidic devices

	CO4	To understand mechanisms of MEMS optical and RF devices.
	CO5	To be exposed to MEMS simulation softwares, Multiscale simulations, CNT and NEMS.
Optimization Techniques	CO1	Should be able to solve linear multivariable optimization using linear programming and perform sensitivity analysis.
	CO2	Should be able to solve single-variable, non-linear, unconstrained optimization problems
	CO3	Should be able to solve geometric programming optimization problems using standard techniques for each case.
Renewable Energy	CO1	After completion of this course, the student will able to understand in detail the uses and production of electrical energy from solar, wind,biomass and ocean energys.
Smart Materials/ Advanced Materials	CO1	Understand the need and explain different types of composite materials.
	CO2	Summarize the various methods for manufacturing of the composite materials.
	CO3	Distinguish between the properties and uses of different reinforcement fibres.
	CO4	Explain the principles, types and applications of different functionally graded materials and shape memory alloys.
	CO5	Outline the evolution, history, applications and impact of nanotechnology.
Total Quality Management	CO1	Develop an understanding on quality management philosophies and frameworks.
	CO2	Understand the fundamental principles of total quality management.
	CO3	Choose approximate statistical techniques for improving processes.
	CO4	Develop in-depth knowledge on various tools and techniques of quality management.
	CO5	Know what cultural transformation is necessary for successful implementation of total quality practices with his/her organization.
Environmental Engineering Lab	CO1	Determine pH, turbidity, Conductivity, Total dissolved solids, Alkalinity and Acidity of water sample in laboratory
	CO2	Determine Chlorides, iron, Dissolved Oxygen, Nitrogen, total Phosphorous in water sample in laboratory
	CO3	Determine and Estimate total solids, organic solids and inorganic solids in water sample in laboratory
	CO4	Determine B.O.D and C.O.D of waste water sample in laboratory
	CO5	Determine Optimum coagulant dose, Chlorine demand, coli form in drinking water sample in laboratory
Geotechnical Engineering Lab	CO1	Determine Atterberg’s limits and Differential free swell for clayey soils in laboratory
	CO2	Determine relative density, dry density & moisture contents in the field and laboratory by core cutter, sand replacement and compaction tests
	CO3	Determine permeability and analyze coarse and fine grain sizes in laboratory

	CO4	Determine shear strength and shear strength parameters by vane shear, tri-axial, direct shear & unconfined compression tests in laboratory
	CO5	Determine CBR value and consolidation settlement & swell pressure in laboratory
GIS Lab	CO1	Prepare a georeferenced and projected toposheet for digitization
	CO2	Create thematic maps for estimating geographical features and layout preparation
	CO3	Generate digital elevation model using the elevation point data and estimate the volume
	CO4	Apply GIS in road network analysis
	CO5	Apply GIS in water resources engineering applications
Finite Element Methods	CO1	Describe the concepts of FEM and principles of elasticity
	CO2	Explain and analyze one and two-dimensional FEM including problems
	CO3	Develop stiffness matrix for one and two dimensions
	CO4	Analyze Iso-parametric elements by various methods
	CO5	Analyze Axi-symmetric elements and solution techniques for static loads
Advanced Structural Design	CO1	Design of Retaining walls, cantilever and counter fort
	CO2	Design of RCC and steel water tanks
	CO3	Describe about bunkers, silos and Chimney and design of concrete bridges
	CO4	Design of plate girder for railway bridges, gantry girders and steel truss bridges
	CO5	Design of Multistory buildings considering seismic and wind loads
Ground Water Development and Management	CO1	Explain about ground water sources and its movement
	CO2	Analyze pumping test data of aquifers
	CO3	Explain about surface and sub surface investigations
	CO4	Describe Artificial Recharge of Ground Water and its Applications of GIS and Remote Sensing
	CO5	Describe about Saline Water Intrusion in aquifer and its case studies
Environmental Impace Assessment and Management	CO1	Describe basic concepts and Methodologies of EIA
	CO2	Assess Impact of Developmental Activities and Land use
	CO3	Assess Impact of development Activities on Vegetation, wildlife and deforestation
	CO4	Explain about Environmental Audit, legislation and Acts
	CO5	Describe case studies and prepare EIA statement for various Industries
Soil Dynamics and Machine Foundation	CO1	Describe concepts of theory of vibrations and different methods of analysis
	CO2	Explain about wave propagation and dynamic properties of soil
	CO3	Describe about design criteria of machine and block foundations under various degrees of freedom
	CO4	Analyze and design of machine foundations subjected to various vibration systems as per IS code
	CO5	Describe types and methods of vibration isolation
	CO1	Describe concepts and characteristics of watershed management

Water Shed Management	CO2	Explain principles of erosion and various measures to control erosion
	CO3	Describe about rain water harvesting and its structures
	CO4	Describe about land management
	CO5	Describe about ecosystem management
Pavement Analysis and Design	CO1	explain about pavement types and their design parameters
	CO2	Analyze stresses in flexible and rigid pavements
	CO3	Design of flexible and rigid pavements by using various methods
	CO4	Describe highway materials, construction of various pavements and soil stabilization
	CO5	Explain about need of highway maintenance and strengthening of existing pavements
Advanced Structural Analysis	CO1	Analyze continuous beams and simple portal frames by moment distribution method
	CO2	Draw Influence line diagrams for determinate beams, trusses, two hinged and three hinged arches
	CO3	Analyze continuous beams and plane trusses by flexible and stiffness methods
	CO4	Analyze portal frames by flexible and stiffness methods.
	CO5	Describe about plastic analysis
Bridge Engineering	CO1	Describe about standard specifications of Indian road bridge codes
	CO2	Design and detailing of RCC and steel bridges
	CO3	Design and detailing of RCC slab and box culverts
	CO4	Explain about different types of RCC and steel bridges
	CO5	Describe and design of piers, abutments and maintenance of bridges
Project Work	CO1	Understand the problem of a project which is going to be done.
	CO2	Learn how to analyze the problem in many possible ways and choose the best one
	CO3	Understand how to do the literature review on the same problem and they understand how to compare the problem with the literature
	CO4	Learn how to write methodology of the project
	CO5	Learn how to document the project with conclusions

M.Tech POs, PSOs & COs

DEPARTMENT OF ECE - M.Tech -VLSI A.Y: 2017-18

Program Outcomes	
PO1	Apply the knowledge of mathematics, science, engineering fundamentals to solve complex VLSI system design problems.
PO2	Apply research based knowledge to design and conduct experiments, analyze, synthesize and interpret the data pertaining to VLSI system design problems and arrive at valid conclusions.

PO3	Design solutions for VLSI system design problems and design system components and processes that meet the specified needs with appropriate consideration for public health and safety.
PO4	Function effectively either as a member or a leader in a multi disciplinary activities.
PO5	Identify, formulate and analyse problems related to VLSI system design and substantiate the conclusions using the first principles of sciences and engineering.
PO6	Develop consciousness of professional, ethical and social responsibilities as experts in the field of VLSI technology.
PO7	Communicate the engineering activities to engineering society for documentation and presentation.
PO8	Analyze the impact of VLSI technology in a global, economic, environmental and societal context.
PO9	Realize the need for lifelong learning and engage them to adopt technological changes in their specialized areas of VLSI system design.
PO10	Continuously update their knowledge on contemporary issues.
PO11	Construct, choose and apply the techniques, resources and modern engineering toolsÂ Â required for VLSI system design applications.
PO12	Engage in life-long learning and pioneer in different areas of VLSI system design.
PO13	Demonstrate effective oral and written communication skills in accordance with technical standards.

Program Specific Outcomes

PSO1	Acquire competency in areas of VLSI, digital and mixed signal integrated circuits, IC Fabrication, Design, Verification, and Testing.
PSO2	Apply appropriate techniques, resources, and modern tools to complex engineering activities in the domains of VLSI System Design.

COURSE OUTCOMES

Course Title		Description of the Course Outcome
Digital System Design& Testing	CO1	Apply knowledge of digital systems, Sequential Circuit Design and design of digital logic circuits
	CO2	Explain fault modeling and classes.
	CO3	Apply knowledge of different algorithms for generating test patterns.
	CO4	Detect states and faults in sequential circuits.
	CO5	Explain PLA minimization and testing.
	CO6	Analyze an asynchronous sequential machines
Digital Design Through HDL	CO1	Design and implement the fundamental digital logic circuits using Verilog & VHDL at various levels of abstractions.
	CO2	Write the Test bench simulation programs for all logic circuits.
	CO3	Use the tasks and functions in digital system design process.
	CO4	Design a large digital systems based on small modules.

	CO5	Analyze the timing parameters of simulation and synthesis process.
Analog IC Design	CO1	Design two stage CMOS operational amplifiers and compensation techniques.
	CO2	Illustrate current mirror circuits in single stage CMOS operational amplifiers.
	CO3	Illustrate advanced current mirrors and comparators.
	CO4	Understand PLL use in integrated circuits
	CO5	Understand switched capacitor circuits.
	CO6	Design and analyze CMOS A/D and D/A data converters of different types.
Digital IC Design	CO1	Able To Understand The Concepts of MOS Transistor and the CMOS Inverter.
	CO2	Able to understand the concepts and designing of digital building blocks like combinational logic circuits, sequential logic circuits using VHDL.
	CO3	Able to understand the design of building blocks of digital ICs using various modeling techniques.
	CO4	Able to Analyze modes of operation of MOS transistor and its basic electrical properties
	CO5	Able to Calculate the parasitic resistance and capacitance produced by the layouts and thus designing circuits with better performance
	CO6	Design various combinational circuits using gates and transistors for RAM and ROM
Embedded System Design	CO1	Distinguish Embedded System & General Purpose Computing System and formulate the typical embedded system
	CO2	Describe the characteristics, Quality Attributes of an Embedded System and core of the embedded systems.
	CO3	Explain the concepts of different types of memory and communication interfaces.
	CO4	Use firmware approaches and modern engineering tools necessary for developing firmware & hardware in embedded system design
	CO5	Explain the concepts of Real Time Operating System (RTOS) based embedded system design.
	CO6	Identify the issues in real time operating systems and choose an appropriate RTOS.
Semiconductor Devices Modeling	CO1	Apply the concepts of current density equations, continuity equation
	CO2	Develop consciousness on diode leakage current, excess charge carriers, and diffusion capacitance.
	CO3	Function effectively on poly silicon work function and depletion effects
	CO4	Design solutions with appropriate bipolar device modeling
	CO5	Demonstrate knowledge and understanding of long and short channel MOSFETS.
	CO6	Apply appropriate models to complex engineering activities with an understanding of limitations.

Hardware & Software Co-design	CO1	Analyze any embedded system's hardware and software design issues
	CO2	Choose different Co-design Models, Algorithms and methodology etc., for embedded design
	CO3	Apply Embedded Software Development tools, Compilation Techniques for embedded applications
	CO4	Test the hardware and software individually
	CO5	Explain the System-level performance modeling, low-level performance modeling and High-level synthesis
Embedded and Real time systems	CO1	Demonstrate the basics of embedded systems
	CO2	Explain the different processors and their technologies.
	CO3	Use the various state machine and concurrent process models of RTOS
	CO4	Extrapolate the different RTOS communication processes
	CO5	Identify the appropriate embedded/RTOS concept
	CO6	Discuss the different operating systems associated with embedded and RTOS.
HDL Programming Laboratory	CO1	Simulate the digital circuits by using VHDL/ Verilog.
	CO2	Synthesis and implement the digital circuits by using VHDL.
	CO3	Generate RTL schematics and timing constraints.
	CO4	Produce power report and Place and Route report of digital circuit synthesis.
	CO5	Implement the digital circuits by using FPGA devices
Mixed Signal IC design	CO1	Learn analysis of switched capacitor circuits.
	CO2	Learn non ideal effects in switched capacitor circuits.
	CO3	Know dynamics of PLL blocks.
	CO4	Demonstrate the fundamentals of data converters.
	CO5	Compare different data converters.
	CO6	Learn over sampling converters.
Algorithms for VLSI Design Automation	CO1	Explain VLSI Design Flow, design automachine tools and algorithms
	CO2	Examine various Routing algorithms for layout design.
	CO3	Apply various Routing algorithms for layout design.
	CO4	Explain logic synthesis and verification
	CO5	Apply various Routing algorithms for FPGA.
	CO6	Apply various Routing algorithms for MCM.
Low Power VLSI Design	CO1	Describe in detail the need and use of low power devices in the design of VLSI.
	CO2	Design chips used for battery-powered systems and high-performance circuits not exceeding power limits.
	CO3	Apply in practice technology-level, circuit-level, and system-level power optimization techniques.

	CO4	Design a significant VLSI design project having set of objective criteria and design constraints.
	CO5	Design the conventional CMOS and BICOMS circuits using logic gates.
	CO6	Analyze the quality measures and design perspectives of latches and Flip-Flaps.
Design of Fault Tolerant Systems	CO1	Calculate dependability, reliability, availability, safety, performability, maintainability, and testability
	CO2	Analyze redundancy systems
	CO3	Design circuits that generate test patterns
	CO4	Describe fail safe design circuits.
	CO5	Develop the combinational and sequential circuits for testability
	CO6	Summarize the LFSR and built in self test concepts
VLSI Signal Processing	CO1	Design parallel processors in VLSI systems
	CO2	Implement the register minimization using the retiming, unfolding & folding concepts.
	CO3	Design systolic architecture using canonical mapping and generalized mapping.
	CO4	Analyze the fast convolution algorithms and use them for signal processing applications
	CO5	Design low power multipliers using bit level arithmetic circuits.
	CO6	Design low power multipliers using multiple constant algorithms.
b) System Modeling & Simulation	CO1	Analyze the given system or problem
	CO2	Design a model to represent the system or problem
	CO3	Develop simulation models for time and event driven systems
	CO4	Analyze State machine models
	CO5	Design simulation models for given system using petri nets
	CO6	Analyze the queuing systems and optimization
CPLD and FPGA Architecture and Applications	CO1	List the features and know the architecture of different PLDs
	CO2	Design the different families of CPLD & FPGs
	CO3	Realize out finite state machines
	CO4	Understand the concept system level design by using design methods
System on Chip (SOC) Design	CO1	Memorize the system architecture, components of system hardware and software.
	CO2	Know the basic concepts of processor architecture and instructions and delays.
	CO3	Describe external and internal memory of SOC and organization.
	CO4	Explain bus architectures and models of SOC.
	CO5	Know SOC customization and reconfiguration technologies.
	CO6	Apply the knowledge of SOC design in real time applications
Mixed Signal simulation Lab	CO1	Design layouts for various combinational logic circuits and logic functions.
	CO2	Examine mixed signal design flow

	CO3	Design Analog Circuits Simulation using Spice Software
	CO4	Analyze Layout Extraction for Analog & Mixed Signal Circuit.
	CO5	Measure frequency response, harmonic and inter modulation distortion, and noise behavior
Technical Seminar	CO1	Identify and analyze research oriented theme from recent peer reviewed journals
	CO2	Promote presentation, research and oral skills
	CO3	Adopt technological changes to support needs of the society
Project Work Phase - I	CO1	Identify and analyze research oriented problem from recent peer reviewed journal
	CO2	Analyze and synthesize the identified problem
	CO3	Solve and Implement complex problems and arrive at valid results and conclusions
Project Work Phase - II	CO1	Use modern tools to solve the problem
	CO2	Promote research and demonstration skills
	CO3	Enhance writing and documentation skills

Department of EEE - M.Tech -Power Electronics and Electric Drives A.Y: 2017-18

Program Outcomes	
PO1	a. Will be a professional workforce in the areas of "Static Power Electronics Converters", "Power Electronic Converter fed Electrical Drives" and "Power Quality".
PO2	b. Will be able to apply soft computing techniques for Power Electronic Systems and Electric Drives.
PO3	c. Will be able to understand large scale Power Electronic Converter Systems, Electric Drives and issues involved through modeling, analysis and simulation.
PO4	d. Will be able to apply present day techniques and tools to solve Power electronic and electric drives problems relevant to current needs.
PO5	e. Will be able to use state of the art simulation tools such as MATLAB, SIMULINK, PLEXIM, SABER, OPALRT Lab, DSPACE, MULTISIM, LABVIEW and other Tools.
PO6	f. Will be capable of contributing positively to collaborative and multidisciplinary research to achieve common goals.
PO7	g. Will demonstrate knowledge and understanding of electrical and electronics engineering and management principles and apply the same for efficiently carrying out projects with due consideration to economical and financial factors.
PO8	h. Will be able to communicate confidently, make effective presentations and write good reports to engineering community and society.

PO9	i. Will recognize the need for lifelong learning and have the ability to do it independently.
PO10	j. Will become aware of social issues and shall contribute to the community for sustainable development of society.
PO11	k. Will be able to independently observe and examine critically the outcomes of his/her actions and apply corrective measures subsequently and move forward positively through a self corrective approach.
PO12	l. Will able to continuously update their knowledge on contemporary issues.
PO13	m. Will able to imbibe the values of honesty and integrity.

Program Specific Outcomes	
PSO1	Ability to apply the knowledge of Power electronics and drives for the betterment of industry as well as society.
PSO2	Ability to identify, analyze and solve complex engineering problems in power electronics and drives.
PSO3	Ability to apply modern engineering tools and project management techniques in the area of power electronics and drives.

	COURSE OUTCOMES	
ELECTRICAL MACHINE MODELING AND ANALYSIS	CO1	Determine the developed torque in Kron's primitive Machine and determine the dynamic model of a DC machine.
	CO2	Determine the dynamic model & Small signal model of three phase induction machine based on the dq0 Transformation and determine instantaneous torque developed in an induction Machine which leads to advanced control strategies such as vector control and direct torque control.
	CO3	Analyze and model the Symmetrical and Unsymmetrical Two phase induction machine.
	CO4	Analyze and model the three phase synchronous machine.
	CO5	Analyze the dynamic analysis of synchronous machine under three-phase fault condition.
ANALYSIS OF POWER ELECTRONICS CONVERTERS	CO1	Describe the operation of dc-dc, dc-ac, ac-dc and ac-ac power converters.
	CO2	Explain the control characteristics of power semiconductor switching devices
	CO3	Calculate the values of circuit parameters to limit output ripple voltages and currents of a converter with specified values
	CO4	Evaluate the effects of various modulation techniques on the quality of input and output waveforms.
	CO5	Analyze and evaluate the performance of a simple power circuit.

POWER ELECTRONIC CONTROL OF DC DRIVES	CO1	Able to understand the concept of modeling and analysis of DC motors.
	CO2	Able to design controllers for closed loop and open loop transfer function of DC motor drives.
	CO3	Able to analyze the controlled converter and DC chopper circuits.
	CO4	Able to Analyze the Dual Converter Control of DC motor
	CO5	Able to Distinguish the difference between PWM controller and hysteresis controller
MICROCONTROLLERS AND APPLICATIONS	CO1	Understand the architecture of basic 8051 Micro-controller.
	CO2	Understand and impart the knowledge about instructions, interrupts and addressing modes.
	CO3	Understand the architecture of advanced Microcontrollers like PIC, ATMEL and Flash type PIC.
	CO4	Develop skill in writing simple programs for 8051.
	CO5	Develop skill in writing programs for interfacing peripherals with Micro- controllers.
MODERN CONTROL THEORY	CO1	Ability to apply current knowledge and applications of algebra concepts to find solutions of linear matrix equations
	CO2	Ability to design algebra concepts to solve and analyze the response of dynamic systems
	CO3	Ability to understand the concepts of linear vector space in engineering analysis.
	CO4	Ability to understand the non – Linear systems and analyze the Non-Linear systems through describing functions.
	CO5	Ability to find the stability of Non-Linear systems.
PROGRAMMABLE LOGIC CONTROLLERS	CO1	Able to learn the basic PLC system construction and programming.
	CO2	Able to learn ladder diagrams for different process control.
	CO3	Able to learn the Characteristics of PLC Registers.
	CO4	Able to learn PLC Function and data handling Functions.
	CO5	Able to learn data handling functions which are useful for the Robotics and PID applications
DESIGN AND MONITORING OF MACHINES	CO1	Able to learn the design and monitoring details and the need for monitoring of the electrical equipment.
	CO2	Able to learn the design and Monitoring of transformers.
	CO3	Able to learn the design of DC Machines.
	CO4	Able to learn the design of Induction and Synchronous Machines.
	CO5	Able to learn the Monitoring of electrical Machines.

NON-CONVENTIONAL ENERGY SOURCES AND APPLICATIONS	CO1	Extend the principles of various renewable energy sources and applications of Solar power in day to day life.
	CO2	Examine the working of wind turbines (Horizontal and Vertical Axis Turbines)
	CO3	Outline the working of OTEC & Geothermal power plants.
	CO4	Generalize the concepts of Bio gas and MHD plants.
	CO5	Illustrate the necessity of Hybrid systems.
POWER ELELCTRONICS SYTEMS SIMULATION LAB	CO1	The students can analyze how the thyristors can work along with their characteristics, analysis of half controlled and fully controlled converters, choppers, cyclo-converters,
	CO2	AC voltage controllers, inverters how they are applied on electric drives by using MATLAB/ SIMULINK.
SWITCHED MODE POWER CONVERTERS	CO1	Understand of the basic principles of switch mode power conversion and design Forward and fly- back converters and push pull topologies.
	CO2	Analyze and design the half bridge and full-bridge converters.
	CO3	Design Small-Signal Model Development and Analysis for switched-mode dc-dc converters using averaging techniques, including the derivation and visualization of converter small-signal transfer functions.
	CO4	Analyze the P, PI, PID controller.
	CO5	Analyze, modeling and design resonant converters and Quasi-Resonant Converters i.e. ZCS and ZVS resonant converters.
POWER ELECTRONIC CONTROL OF AC DRIVES	CO1	Able to generalize the concept of VSI and CSI fed induction motor drives.
	CO2	Able to Analyze the Slip power recovery scheme.
	CO3	Able to design vector control of Induction motors drive.
	CO4	Able to discuss control schemes of Synchronous machines.
	CO5	Able to explain about PMSM- Motor, Brushless dc motor and Variable Reluctance motor drives.
FLEXIBLE AC TRANSMISSION SYSTEMS	CO1	Students will able to List the advantages of FACTS controllers for control of power in transmission systems.
	CO2	Students will able to identify the differences between series and shunt controllers.
	CO3	Students will able to understand the necessity of transmission inter connections and benefits of FACTS controllers.
	CO4	Students will able to understand compensation methods by using series and shunt compensation.
	CO5	Students will able to understand the methods of controllable VAR generation.

ADVANCED DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS	CO1	Understand types of digital signals and Transforms and its application to signals and systems.
	CO2	Design of IIR & FIR filters.
	CO3	Understand different DSP processors and basic programming skills.
	CO4	Understand multi rate DSP systems
	CO5	Design and Implementation of Digital filters using MATLAB.
ANALYSIS OF DYNAMIC SYSTEMS	CO1	Ability to model electrical systems.
	CO2	Ability to select operating points and compute system variables at steady-stateconditions using nonlinear models.
	CO3	Ability to find stability of a discrete time systems.
	CO4	Ability to design controllers by different classical methods.
	CO5	Ability to represent the discrete time in state space representation in advance methods
INTELLIGENT CONTROL	CO1	Understand the basics of adaptive control systems.
	CO2	Understand the fundamentals of fuzzy sets theory and fuzzy-logic control.
	CO3	Learn the constructions, properties and uses of neural networks.
	CO4	Identify applications of intelligent control systems to specific areas.
	CO5	Develop skills to design and implement intelligent control systems.
POWER QUALITY MANAGEMENT	CO1	Able to understand the basic needs, issues and problems related to power quality.
	CO2	Able to understand the real time power disturbances in industrial and commercial electric power Systems.
	CO3	Acquire knowledge in wide range of issues, from poor power factor, current harmonics, to voltage disturbances like sags, swells, outages and transients, and performance wiring and grounding.
	CO4	Can emphasize different techniques used for power quality events.
	CO5	Able to understand applied harmonics and power quality monitoring.
ENERGY AUDITING, CONSERVATION AND MANAGEMENT	CO1	Students will able to understand the necessity of energy auditing and electricity tariffs.
	CO2	Students will able to understand Efficiency of Electrical Equipments.
	CO3	Students will able to understand Reactive power management, capacitor sizing.
	CO4	Students will able to understand concept of Cogeneration.

POWER ELECTRONICS AND DRIVES LABORATORY	CO1	CO1: The students can analysis of fully controlled converters, four quadrant Chopper, ac voltage controllers, and PWM inverters how they are applied on electric drives.

Dept.Of CIVIL - M.Tech(Structural Engg.) - AY- 2017-18

Program Outcomes	
PO1	Able to demonstrate and apply technical knowledge of engineering in design and operation of various thermal systems
PO2	Able to design and conduct experiments, by applying both analytical and creative thinking and interpret data to produce meaningful conclusions and recommendations
PO3	Able to solve thermal engineering problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions to meet desired need within realistic constraints such as economic, environmental, social, safety and sustainability.
PO4	Able to work individually or as a member with responsibility to function on multidisciplinary team.
PO5	Able to identify, formulate and solve thermal engineering problems by apply and adapt techniques using IT tools for modeling and analysis of thermal engineering systems.
PO6	Able to understand professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes in thermal engineering professional practices.
PO7	Able to convey thoughts confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.
PO8	Able to possess knowledge and understanding of group dynamics, recognize opportunities and contribute positively to collaborative-multidisciplinary scientific research, demonstrate a capacity for self-management teamwork, and decision making.
PO9	Able to recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.
PO10	Having knowledge about contemporary issues.
PO11	Student will be able to use the techniques, skills and modern engineering tools necessary for engineering practices.
PO12	Able to demonstrate knowledge of engineering and management principles to manage projects efficiently in thermal engineering as a member

PO13	Able to have responsiveness towards development of R&D activities and contribute to industry/academia

Program Specific Outcomes

PSO1	Empower the graduates to apply the knowledge of structural engineering in the field of construction industry for the design of civil structures.
PSO2	Enable the students to take up the carrier in the field of structural engineering with high ethical values environmental and social issues.
PSO3	Facilitate graduates to use research based knowledge and innovative methods in structural engineering analysis, design and interpretation of data.

COURSE OUTCOMES

Course Title		Description of the Course Outcome
Advanced Mathematics	CO1	Solve one-dimensional Heat equation, two-dimensional, three-dimensional Laplace Equation in Cartesian and polar coordinates.
	CO2	Estimate numerical solutions to Heat and Laplace Equations in Cartesian coordinates using different methods.
	CO3	Estimate point estimation, interval estimation for large and small samples.
	CO4	Test the hypothesis for large and small samples.
	CO5	Estimate regression, correlation coefficients for a given data, fit a curve to a given data using method of least squares. And Calculate partial regression coefficients, identify suitable test of significance for a given problem and perform analysis of variance for a given data.
	CO6	Evaluate boundary value and eigen value problems by Shooting method, Finite difference method, Polynomial method and Power method.
Theory of Elasticity and Plasticity	CO1	Define elasticity, components of stress & strain, Analyse plane stresses and strains, Differential equations of equilibrium, compatibility.
	CO2	Determine two dimensional problems in rectangular coordinates
	CO3	Determine two dimensional problems in polar coordinates
	CO4	Analyse and determine Stress and Strain in Three Dimensions
	CO5	Discuss Concepts, assumption and yield criterions of theory of plasticity.
	CO6	Analyse torsion of straight bars and discuss Stress function, Warp function & Membrane analogy
Theory of Plates and Shells	CO1	Analyze UDL rectangular plates with simply supported edges and fixed edges
	CO2	Analyze thin rectangular Plates using Small Deflection theory under various loading conditions.
	CO3	Analyze symmetrically loaded circular plate under various loading conditions and annular plates.

	CO4	Derive stress resultants using Principles of membrane theory, bending theory of equilibrium equations.
	CO5	Derive the governing DKJ equation for bending theory, details of Schorer's theory.Analyze and design of short and long shells.
	CO6	Analyze and design elliptic Paraboloid, Conoidal and Hyperbolic Paraboloid shapes by membrane theory.
Matrix Analysis of Structures	CO1	Identify Static indeterminacy and kinematic indeterminacy and degree of freedom
	CO2	Compute element stiffness matrix for truss element ,beam element and torsionl element and displacement equations
	CO3	Identify and design the two dimensional and three dimensional elements like truss, beam, grid etc. by flexibility method.
	CO4	Design the simple pin jointed members by stiffness matrix method
	CO5	Design the simple pin jointed members by stiffness matrix method
	CO6	Explain shear walls necessity and analyse structural behavior of large frames with and without shear walls
Experimental Stress Analysis	CO1	Explain strain measurement methods
	CO2	Analyze strain gauge data
	CO3	Explain Non Destructive testing methods
	CO4	Explain Brittle coating methods
	CO5	Explain theory of photo elasticity
	CO6	Analyse two dimensional photo elasticity by using various methods
Foundation Engineering	CO1	Explain various methods of sampling and types of samples
	CO2	Describe bearing capacity of soils and various types of shear failures
	CO3	Design of isolated, combined, mat and floating foundations
	CO4	Explain settlement of shallow foudations and its types
	CO5	Explain different types of pile foundations and factors influencing load carrying capacity
	CO6	Explain design approach and suitability criteria of piled raft foundations
Optimization in Structural Design	CO1	Discuss need and scope for optimization, historical development, statements of optimization problems and Classify optimization problems.
	CO2	Analyze single and multi variable optimization problems by using differential calculus method, method of constrained variation and Lagrange multipliers ,Kuhn-Tucker conditions.
	CO3	Design of fully stressed and optimality criterion based algorithms.
	CO4	Apply Non-Liner programming for Unconstrained and constrained minimization by using different methods.
	CO5	Analyze Linear programming by using Simplex and Duality methods
	CO6	Explain quadratic programming, Geometric programming,Dynamic programming and Design beams and frame using dynamic programming technique.
Advanced Concrete Technology	CO1	Discuss Materials like Cement, Aggregates, Fresh and hardened concrete, Admixtures, types of admixtures and purpose, chemical composition.

	CO2	Explain the Importance of Concrete behavior under corrosion, disintegrated mechanisms, Acoustical emission methods, Impact echo methods, Ultrasound pulse velocity methods
	CO3	Analyze and design of Repair and rehabilitation of structural elements.
	CO4	Design Strengthening and stabilization of beams and columns.
	CO5	Explain Mechanical properties of Fibre reinforced concrete.
	CO6	Explain properties and design of light weight concrete and High performance concrete .
Offshore Structures	CO1	Discuss Physical Environmental aspects of Marine and offshore constructions.
	CO2	Explain basic concepts of Marine and Offshore construction equipment.
	CO3	Explain Installation of Piles in marine and offshore Structures.
	CO4	Discuss basic concepts of Offshore platforms.
	CO5	Explain basic concepts of Submarine Pipelines.
	CO6	Discuss basic concepts of underwater repairs to steel jackets.
Plastic Analysis and Design	CO1	Explain basic hypothesis,steel Moment curvature relation and basic difference between elastic and plastic analysis
	CO2	Analyze Method of Limit Analysis of simply supported fixed beams and continuous beams, rectangular portal frames, gable frames, grids.
	CO3	Explain basic principles of Limit design theorems by various methods
	CO4	Analyze Deflection in Plastic beams and frames
	CO5	Design beam to column Moment resisting connections.
	CO6	Design minimum Weight and linear Weight functions
Advanced Concrete Lab	CO1	Explain to determine physical properties of cement
	CO2	Explain to determine physical properties of fine and coarse aggregates
	CO3	Explain to determine the properties of fresh concrete
	CO4	Explain to determine the properties of hardened concrete
	CO5	Explain to determine permeability of concrete and perform Marsh Cone test
	CO6	Explain the effect of W/C ratio and admixtures on concrete
Finite Element method in Structural Engineering	CO1	Explain history and basic concepts of F.E.M.
	CO2	Explain formulation of the finite element method,Coordinate system (local and global).
	CO3	Derive stiffness matrix for trusses under axial forces.
	CO4	Discuss various element shapes, Triangular element and Discretization of a structure.
	CO5	Analyze Stiffness Matrix for a two noded Truss Element, Threenoded Truss element and Two noded Beam element in Local and Global (2D).
	CO6	Analyze Various elements used, Tetra-hedrons, Hex-hedrons. Requirements on Representation of element behavior functions.

Computer applications and CAD	CO1	Explain tasks and benefits in CAD
	CO2	Explain basic concepts of CAD software and hardware
	CO3	Explain Computer graphics and Computer aided drafting.
	CO4	Analyse simply supported beam by using STAAD Pro
	CO5	Analyse cantilever beam by using STAAD Pro
	CO6	Analyse Stiffness properties of members
Stability of Structures	CO1	Analyze beams column with different end conditions and determine the stresses and bending moments.
	CO2	Analyze and derive the elastic buckling of straight columns, eccentrically and laterally loaded columns in sway & non sway mode using Energy methods .
	CO3	Derive buckling of bars with intermediate compressive forces and distributed axial loads, change in cross section and analyze initial curvature on bars in sway and non-sway mode.
	CO4	Demonstrate Critical stress diagram and design columns based on buckling under various end conditions
	CO5	Analyze the Buckling problem of orthogonality relation using Ritz method,Timeshinko method, Galerkin method.
	CO6	Analyze the beams of rectangular cross section and I Section subjected for pure bending.
Structural Dynamics and Earth Quake Resistant Design	CO1	Explain earthquake phenomenon and engineering seismology
	CO2	Explain basic concepts of structural dynamics
	CO3	Analyze Single Degree of Freedom Systems
	CO4	Analyze Multi Degree of Freedom Systems
	CO5	Explain the principle of design criteria by seismic Co efficient methods
	CO6	Explain ductile detailing provisions as per IS Code
Prestressed Concrete	CO1	Explain General principles of Pre-stressing and Post tensioning
	CO2	Analyze prestress and Bending stresses in tendons.
	CO3	Analyze various losses of Pre-stressing.
	CO4	Analyze deflections of pre-stressed concrete beams:
	CO5	Design Flexural, shear, torsional resistance of Prestressed concrete section.
	CO6	Analyze stresses in Composite sections.
Composite Materials	CO1	Discuss fiber reinforced composite, types and its application
	CO2	Explain design concepts of composite materials.
	CO3	Explain Polymer Matrix Composites (PMC's) Metal Matrix Composites (MMC's) Ceramic Matrix Composites (CMC's)
	CO4	Analyze Elastic properties and stress-strain relations, fracture behavior.
	CO5	Explain Properties of matrix and reinforced materials.
	CO6	Analyze bending and torsion of composite beams.

Fracture Mechanics	CO1	Discuss Fundamentals of elastic and plastic behaviour of materials and history of fracture mechanics.
	CO2	Explain Principles of Linear Elastic Fracture Mechanics.
	CO3	Explain geometric features of photo elastic fringes observed near the crack tip.
	CO4	Analyze Griffith's criteria for crack propagation.
	CO5	Explain Material characterisation by Crack Tip Opening Displacements
	CO6	Analyze Experimental determination of fracture parameters
Industrial Steel Structures	CO1	Explain Limit analysis of steel structures and Redistribution of moments.
	CO2	Analyze Portal frames and thier Mechanisms.
	CO3	Analyze Light gauge steel structures.
	CO4	Analyze stiffened compression elements and multiple stiffened compression elements.
	CO5	Design Steel Towers, Trestles and Masts.
	CO6	Explain and analyze Mill Bents.
Bridge Engineering	CO1	Explain hydraulic factors in bridge design and its importance.
	CO2	Analyze design loads on minimum depth of foundation bridges,
	CO3	Design masonary arch bridges.
	CO4	Design Pipe culvert by considering hydraulic and structural aspects.
	CO5	Analyze slab bridges by using various methods.
	CO6	Design prestressed concrete bridges.
Design of Sub Structures	CO1	Explain basic concepts of substructures.
	CO2	Explain various marine substructures and design loads of substructures.
	CO3	Design Rouble-Mound break waters, Wall type break waters, Gravity wall ,anchored bulk head and piled wharf structures.
	CO4	Classify sheet pile structures and Design cantilever sheet piling wall, anchored bulkheads, anchorage methods, braced sheeting in cuts, cellular cofferdams.
	CO5	Analyze forces on tower foundations and Discuss general design criteria, choice and type of foundation, design procedure.
	CO6	Explain types of machine foundations and Design machine foundations using IS code provisions and detailing.
CAD Lab	CO1	Analyze shear forces and bending diagrams for beams using graphic in C.
	CO2	Design beams,columns and slabs using Excel.
	CO3	Analyze truss using STAAD Pro.
	CO4	Analyze 2D Frames and multistoried frames using STAAD Pro.
	CO5	Analyze beams,columns using STAAD Pro.
	CO6	Analyze bridge deck slab using STAAD Pro.

Program Outcomes	
PO1	Apply knowledge of computing, mathematics, science and engineering to real life problem solving.
PO2	Design, implements, and evaluate a computer-based system, process, component, or program to meet desired needs.
PO3	Apply design and development principles of software and/or hardware systems of varying complexity.
PO4	Use current techniques, skills, and tools necessary for computing practice.
PO5	Continuously update their knowledge on contemporary issues and present / express ideas in impressive and professional manner.
PO6	Understanding the impact of computer science and engineering solutions in the societal and human context.
PO7	Become entrepreneur based on societal needs.
PO8	Understand professional, ethical, legal, security and social issues and responsibilities.
PO9	Function effectively on teams to accomplish a common goal.
PO10	Recognize need for and engage in continuing professional development through Life Long Learning.
PO11	Explore research gaps, analyze and carry out research in the specialized/emerging areas

Program Specific Outcomes	
PSO1	Model, design and develop robust computer applications by applying tools and techniques.
PSO2	Apply knowledge in various domains to scatter the needs of society through research.

	Course Outcomes	
Data Structures and Algorithms	CO1	Analyze the efficiency of the designed algorithms, and apply abstractions.
	CO2	Identify the strengths and weaknesses of different search and sorting algorithms;
	CO3	Design and employ appropriate data structures and algorithms for implementing dictionaries;
	CO4	Develop algorithms for non-linear data structures.
	CO5	Analyze and Design algorithms using Greedy and Divide and Conquer strategies to solve problems.
	CO6	Solving searching problems by designing efficient algorithms using Dynamic Programming, Branch and Bound Method and Back tracking strategies;
Database Management Systems	CO1	Differentiate Database Systems from File Systems and Define the Terminology, Features, Classifications, Characteristics embodied in Database Systems.
	CO2	Interpret, Design and Implement an E-R Model.
	CO3	Create /Modify the Structure and write optimized SQLQueries to extract and modify Information from Tables or Views.

	CO4	Apply proper Techniques such as Normalization and analyze the applicability of a Specific Normal form in designing a Database.
	CO5	Compare various Indexing, Hashing and File Organization Techniques.
	CO6	Explain broad range of Database Management issues including Data integrity, Concurrency And Recovery, security
Computer Networks	CO1	Understand the hierarchical, layered structure of typical network architecture.
	CO2	Describe the node-to-node data transfer and list the multiple access protocols.
	CO3	Explain end-to-end routing of packets and splits long messages into smaller Units
	CO4	Express the enhancements made to IPv4 by IPV
	CO5	Explain end-to-end data transfer and integrity across the network and techniques to improve QoS
	CO6	Outline the features and operations of the various end user application programs.
Operating Systems	CO1	List the Basic Unix commands
	CO2	Familiar with Write shell scripts to automate various tasks
	CO3	Explain UNIX process structure and related system calls.
	CO4	Describe different memory management techniques and signals
	CO5	Discuss file system design tradeoffs
	CO6	Familiarity with Interprocess Communication using pipes, shared memory, semaphores and message Queues.
Object Oriented Programming	CO1	Illustrate the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, and encapsulation.
	CO2	Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
	CO3	Design and develop programs using packages and interfaces.
	CO4	Develop the mechanism of exceptional handling and multithread
	CO5	Implements the concept of event handling and GUI interface using Java swings.
Advanced Computer Architecture	CO1	Infer knowledge on Hardware and System Design concepts.
	CO2	Learn about memory hierarchy and performance of cache memory.
	CO3	Design E-cube routing in Hypercube computers and X-Y routing in 2-D mesh.
	CO4	Justify identify permissible latencies and forbidden latencies for the given non-linear pipeline.
	CO5	Distinguish between RISC and CISC architectures.
	CO6	Design the input-output connections in an Omega Network using perfect shuffle method.
Compiler Design	CO1	To use the knowledge of patterns, tokens & regular expressions for solving a problem.
	CO2	To apply the knowledge of lex tool &yacc tool to devleop a scanner & parser.
	CO3	To develop program to solve complex problems in compiler

	CO4	To write the new CODE optimization techniques to improve the performance of a program in terms of speed & space.
	CO5	To employ the knowledge of modern compiler & its features.
	CO6	To experiment the new tools and technologies used for designing a compiler
Artificial Intelligence	CO1	Possess the ability to formulate an efficient problem space for a problem expressed in English.
	CO2	Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.
	CO3	Possess the skill for representing knowledge using the appropriate technique.
	CO4	Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing.
Bio-Informatics	CO1	Extract information from different types of bioinformatics data (gene, protein, disease, etc.), including their biological characteristics and relationships
	CO2	Employ different data representation models and formats used for bioinformatics data representation, including mark-up languages such as SBML and CellML, and ontologies such as GO ontology
	CO3	Apply the different approaches used for data integration and data management, including data warehouse and wrapper approaches
	CO4	Master computational techniques and diversified bioinformatics tools for processing data, including statistical, machine learning and data mining techniques
	CO5	Analyze processed data with the support of analytical and visualization tools
Systems Lab	CO1	Able to create database with different types of integrity constraints and use of SQL commands such as DDL, DML, DCL, TCL to access data from database objects.
	CO2	Map the model into a relational database system.
	CO3	Implement the given schema on a relational DBMS.
	CO4	Develop advanced packages, stored procedures, triggers and functions using PL/SQL.
	CO5	Classify system calls in UNIX
	CO6	Analyze the concepts of process, threads and file structure 7. Implement IPC using pipes, semaphores, Shared Memory and messages.
Data Mining and Knowledge Discovery	CO1	Recognize types of Data, Data Quality, need of preprocessing and different measures of similarity and dissimilarity.
	CO2	Explain in detail major techniques and algorithms involved in data mining, including techniques and algorithms for data preprocessing, association rule mining, data classification, and data clustering.
	CO3	Evaluate the performance of a classifier.
	CO4	Compare and contrast different classification and clustering algorithms.

	CO5	Apply data mining algorithms and techniques adaptively to real world problem solving.
Software Engineering	CO1	Understand the engineering issues that form the background to develop complex and evolving software-intensive systems.
	CO2	Apply an effective software engineering process, based on knowledge of widely used development lifecycle models.
	CO3	Analyze and translate requirements specification into an implementable design, following a structured and organized process.
	CO4	Formulate a testing strategy for a software system, employing techniques such as black box and white box testing strategies.
	CO5	Evaluate the quality of the requirements, analysis and design work done during the module.
Object Oriented Analysis & Design	CO1	Illustrate the use of unified modeling language for object oriented analysis and design
	CO2	Understand the syntax of different UML diagrams.
	CO3	Apply object oriented analysis and design to build a software system
Web Technologies	CO1	Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, JavaScript in the workings of the web and web applications
	CO2	Analyze a web page and identify its elements and attributes.
	CO3	Create web pages using HTML, DHTML and Cascading Styles sheets.
	CO4	Create dynamic web pages using JavaScript (client side programming).
	CO5	Build web applications using JSP
	CO6	Build web applications using JDBC, Servlets. 7. Create XML documents and XML Schema. 8. Understand, analyze and apply the language JavaScript when developing a web site. 9. Will create a fully functional website(online book store) using MVC architecture
Mobile Computing	CO1	Discover the characteristics of pervasive computing applications including the major system components and architectures of the systems
	CO2	Analyze the strengths and limitations of the tools and devices for development of pervasive computing systems
	CO3	Explore the characteristics of different types of mobile networks on the performance of a pervasive computing system
	CO4	Analyze and compare the performance of different data dissemination techniques and algorithms for mobile real-time applications.
Cryptography & Network Security	CO1	Recognize different Security Attacks, Services and Mechanisms
	CO2	Classify and explain categories of different encryption and decryption techniques
	CO3	Identify the authentication applications such as Kerberos and x.509 directory services
	CO4	Analyze the representation of PGP and S/MIME
	CO5	Familiar with the importance of IP Security and Web Security

	CO6	Exposed to viruses and related threats and design principles of firewalls
Machine Learning	CO1	Describe and design the concepts of learning.
	CO2	Describe and apply learning algorithms.
	CO3	Explain the first principles of neural networks.
	CO4	Describe basics of sampling theory and hypothesis testing.
	CO5	Explain Bayesian learning theorem.
Cloud Computing	CO1	Articulate the basic concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
	CO2	Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
	CO3	Identify the Collaborations of Cloud and evaluate webmail services .
	CO4	Provide the appropriate cloud computing solutions and recommendations according to the applications used.
	CO5	Attempt to generate new ideas and innovations based on Virtualization in cloud computing. Provide Security for cloud applications
Soft Computing	CO1	Explain the learning and adaptation capability of neural and fuzzy systems and genetic algorithm.
	CO2	Describe the learning and retrieval procedures of various neural networks.
	CO3	Comprehend the fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using genetic algorithm.
Simulation & Modeling	CO1	Classification and study of system modeling.
	CO2	Describe the steps involved in continuous system simulation
	CO3	Analyze System Dynamics
	CO4	Study Probability concepts in Simulation and apply different random number generation Techniques and their applications.
	CO5	Articulate queuing disciplines with mathematical solutions and Outline methods for discrete system simulation
	CO6	Organize SIMSCRIPT and GPSS for analyzing, estimating and processing the problems for deriving the simulation output.
Parallel Computing & Algorithms	CO1	Upon successful completion of the course students should be able to
	CO2	Identify the need of Parallel Computing Algorithms.
	CO3	Analyze the performance of the parallel algorithms.
	CO4	Practice Vector matrix –Multiplications.
Digital Image Processing	CO1	Explain basic concepts in image Processing
	CO2	Apply spatial domain techniques for image enhancement
	CO3	List the image compression techniques
	CO4	Discuss various morphological algorithms
	CO5	Classify various image segmentation techniques
	CO6	Describe different color models and color transformations

Object Oriented Analysis & Design Lab	CO1	Implementation of the diagrams in Unified Modeling Language
	CO2	The Difference between Static and Dynamic diagrams designing
	CO3	Create and analyze use case, sequence and other diagrams
	CO4	Apply forward and reverse engineering techniques.
	CO5	make the transition from business model to use cases and even to other models
Web Technologies Lab	CO1	Understand, analyze and apply the role of languages like HTML, DHTML, CSS, XML, JavaScript in the workings of the web and web applications
	CO2	Analyze a web page and identify its elements and attributes.
	CO3	Build web applications using JSP
	CO4	Build web applications using JDBC, Servlets.
	CO5	Will create a fully functional website (online book store) using MVC architecture.

Dept.Of MECH - M.Tech(THER. ENGG) - AY- 2017-18

Program Outcomes	
PO1	Able to demonstrate and apply technical knowledge of engineering in design and operation of various thermal systems
PO2	Able to design and conduct experiments, by applying both analytical and creative thinking and interpret data to produce meaningful conclusions and recommendations
PO3	Able to solve thermal engineering problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions to meet desired need within realistic constraints such as economic, environmental, social, safety and sustainability.
PO4	Able to work individually or as a member with responsibility to function on multidisciplinary team.
PO5	Able to identify, formulate and solve thermal engineering problems by apply and adapt techniques using IT tools for modeling and analysis of thermal engineering systems.
PO6	Able to understand professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes in thermal engineering professional practices.
PO7	Able to convey thoughts confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.
PO8	Able to possess knowledge and understanding of group dynamics, recognize opportunities and contribute positively to collaborative-multidisciplinary scientific research, demonstrate a capacity for self-management teamwork, and decision making.

PO9	Able to recognize the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.
PO10	Having knowledge about contemporary issues.
PO11	Student will be able to use the techniques, skills and modern engineering tools necessary for engineering practices.
PO12	Able to demonstrate knowledge of engineering and management principles to manage projects efficiently in thermal engineering as a member
PO13	Able to have responsiveness towards development of R&D activities and contribute to industry/academia

Program Specific Outcomes

PSO1	Empower the students to apply knowledge and practical skills in the field of thermal engineering and thermal systems design.
PSO2	Enable the student to take-up career in thermal industries with high regard for ethical values, environmental and social issues.
PSO3	Facilitate the students to use research based knowledge and innovative methods in thermal systems design, analysis and interpretation of data.

	COURSE OUTCOMES	
Optimization Techniques & Applications	CO1	Solve single variable non-linear unconstrained optimization problems using elimination, interpolation and gradient-based methods..
	CO2	Calculate optimum solution of unconstrained and constrained geometric programming problems.
	CO3	Perform multi-stage decision processes using dynamic programming including applications like inventory, allocation, replacement.
	CO4	Conduct sensitivity analysis of multi-variable linear programming problems. Perform Monte-Carlo simulation on inventory, queuing problems.
	CO5	Solve integer programming optimization problems using Gomory's cutting plane and branch and bound methods.
	CO6	Perform stochastic linear dynamic programming problems using probability theory.
Advanced Thermodynamics	CO1	Understand laws of thermodynamics, availability, Maxwell's relations and evaluate thermodynamic properties of working substance.
	CO2	Construct PVT surface for real gases. Determine non-reactive mixture thermodynamic and psychrometric properties.
	CO3	Describe combustion reactions including enthalpy of formation, heat of reaction. Determine properties for chemical equilibrium of ideal gases.
	CO4	Perform second law analysis of binary vapour cycles including cogeneration and combined cycles, and on refrigeration cycles.
	CO5	Discuss applicability of phenomenological relations for irreversible processes, and thermo-electric circuits.

	CO6	Describe the mechanisms of various direct energy conversion devices like fuel cells, magneto-hydrodynamic generator and photo-voltaic cells.
Advanced Heat & Mass Transfer	CO1	Analyze 1D and 2D, steady and transient, explicit and implicit, heat conduction problems using finite difference methods. Derive non-dimensionalized governing equations for forced convection.
	CO2	Evaluate heat transfer coefficient for laminar external and internal flows using integral method.
	CO3	Develop concept of boundary layer formation over heated surfaces during forced and free convection, formulation of momentum and energy equations of the laminar boundary layers and their solution by approximate method.
	CO4	Evaluate Nusselt numbers for boiling and condensation for various geometries.
	CO5	Derive expressions for radiant heat exchange in grey, non-grey bodies with transmitting, reflecting and absorbing media. Describe diffusion and convective mass transfer using analogies.
	CO6	Analyze 1D and 2D, steady and transient, explicit and implicit, heat conduction problems using finite difference methods. Derive non-dimensionalized governing equations for forced convection.
Advanced Fluid Mechanics	CO1	Describe Lagrangian and Eulerian fluid motion, stream and velocity potential functions, Euler and Bernouli equations, continuity and momentum equations.
	CO2	Derive Navier-Stokes equations for viscous compressible flow and solve for simple cases like Plain and Hagen Poisoulle flow, Coutte flow, Blasius solution.
	CO3	Derive Prandtl boundary layer theory and its approximate solutions for creeping motion. Compute drag coefficients for different velocity profiles.
	CO4	Describe fundamental concepts of turbulence including Van Driest model, k-epsilon model, Karman vortex trail. Calculate friction for internal flow using Moody's diagram.
	CO5	Explain basic concepts of compressible fluid flow including governing equations, flow regimes, mach cone.
	CO6	Design nozzles, diffusers for compressible flows using Fanno and Releigh Lines. Describe governing equations for expansion and compressible shocks, supersonic wave drag.
Turbo-Machines	CO1	Perform thermodynamic analysis of turbo-machines including isentropic flow, Euler's flow through variable cross sectional area, and unsteady flow.
	CO2	Design convergent, convergent-divergent nozzle. Perform thermodynamic analysis on impulse and reaction steam turbines and design them.
	CO3	Understand normal shock relations for perfect gas, oblique shock waves, normal shock recovery, detached shocks and aerofoil theory.
	CO4	Calculate performance of centrifugal compressors using Stanitz and Stodolas formulae including effects of inlet mach number, prewhirl, pressure recovery.

	CO5	Perform thermodynamic analysis on axial flow compressors and cascade analysis on free and forced vortex blades.
	CO6	Perform thermodynamic flow analysis on axial flow gas turbines. Determine blade stresses, materials, cooling performance. Match compressor and turbine.
Cryogenics Engineering	CO1	Describe the properties of cryogenic fluids.
	CO2	Describe the methods to produce low temperature liquefaction systems for gases by using adiabatic expansion.
	CO3	Describe components of liquefaction systems including heat exchangers, compressors, expanders, expansion valves, along with their losses.
	CO4	Understand different gas separation and purification systems and principles of gas and air separation.
	CO5	Understand cryogenic refrigeration systems, cryogenic fluid storage and transfer, cryogenic storage systems including insulation and fluid transfer mechanisms.
	CO6	Understand applications of cryogenics in space technology, gas industry, biology, medicine and electronics.
Solar Energy Technology	CO1	Differentiate between beam and diffuse solar radiation. Estimate average solar radiation on horizontal and titled surfaces.
	CO2	Conduct performance analysis on liquid flat plate collectors without and with plane reflectors, cylindrical parabolic collectors with orientation and tracking.
	CO3	Design a solar water heating system and layout including heliostats, receivers, power cycles, working fluids and prime movers.
	CO4	Describe sensible heat, latent heat and packaged bed storage devices. Describe other solar devices like stills, air heaters, dryers, solar ponds, solar refrigeration.
	CO5	Describe the principle, construction and applications of solar cells for direct energy conversion.
	CO6	Perform cost benefit analysis and optimization of solar system including discounted cash flow and life cycle costs.
Advanced I.C. Engines	CO1	Understand the differences between ideal and real engine cycles. Understand thermo-chemistry of fuel-air mixtures.
	CO2	Understand gas exchange processes like flow through ports, supercharging and turbo-charging. Determine turbulent characteristics of swirl, squish, pre-chamber engine flows.
	CO3	Understand the mechanism of combustion in SI engines including abnormal combustion and MPFI, and CI engines including fuel spray behavior and common rail fuel injection.
	CO4	Describe emissions measurement, and various exhaust gas treatment devices and methods.
	CO5	Describe fuel supply systems for SI and CI engines to use alternate gaseous fuels like LPG, CNG and Hydrogen.
	CO6	Understand modern trends in IC engines like lean burning, adiabatic concepts, rotary engines, biofuels, HCCI and GDI concepts.

Non-Conventional Energy Sources	CO1	Analyze energy demand and energy resources of the world and nation. Understand the amount of solar radiation received by earth, and radiation measuring instruments.
	CO2	Describe solar energy applications like solar water heating, space heating, solar stills and ponds, solar refrigeration and photo-voltaic generation.
	CO3	Estimate geothermal potential using analytical methods. Describe geothermal harnessing techniques and electricity generating systems.
	CO4	Describe nuclear fusion, fuel cells, photo-voltaic cells, MHD generator, hydrogen fuel based IC engines.
	CO5	Discuss bioenergy generation including bio-conversion processes, bio-gas plant technology, biomass gasification and economics of biomass systems.
	CO6	Compute characteristics of wind energy conversion systems using various coefficients. Describe energy extracting devices from tidal and wave energy.
Material Science for Thermal Engineering	CO1	Describe the production, properties and applications of stainless steel and cast iron.
	CO2	Describe the production, properties and applications of super alloys and titanium & its alloys.
	CO3	Describe the production, properties and applications of grahite, oxide ceramides and borides.
	CO4	Describe the production, properties and applications of nitrides, silicides, refractory metals and alloys (W, Ta, Cb, Rh, Mo).
	CO5	Describe the production, properties and applications of cermets, composites, C-C composites.
	CO6	Describe the production, properties and applications of ablative materials.
Thermal Engineering Lab	CO1	Measure compressibility factor of different real gases.
	CO2	Estimate dryness fraction of steam.
	CO3	Perform flame propagation analysis of gaseous fuels.
	CO4	Conduct performance test, heat balance sheet, exhaust gas analysis on an IC engine.
	CO5	Conduct performance analysis on vapour compression refrigeration unit, on air conditioning unit and on heat pipe.
	CO6	Determine efficiency of solar flat plate collector, and evacuative tube concentrator.
Fuels, Combustion & Environment	CO1	Describe origin, analysis, carborisation, liquification of coal. Describe gasification of coal including blast furnace gas, alcohols and biogas.
	CO2	Perform combustion chemical composition, flue gas, dew point and stoichiometric analysis.
	CO3	Understand theories of reaction kinetics and analyze chemical kinetics of complex and chain reactions. Determine oxidation behavior of hydrocarbons.

	CO4	Understand thermodynamics of combustion including enthalpy of formation, heating value of fuel, and adiabatic flame temperature.
	CO5	Determine laminar and turbulent flame propagation including burning velocity, combustion of fuel droplets and sprays, pulverized fuel furnaces, and fluidized bed systems.
	CO6	Understand the effect of air pollution on environment, human health and methods of emission control.
Energy Management	CO1	Understand the principles of energy management and the role of energy manager various organizations.3
	CO2	Understand types of energy audits. Gather and analyze relevant data.
	CO3	Describe technologies for energy conservation. Assess critically energy usage using energy flow networks, optimization and technical analysis of options.
	CO4	Perform economic analysis including depreciation, risk analysis and budget considerations.
	CO5	Know common methods of evaluation of projects. Understand the need for energy consultant and his selection criteria.
	CO6	Understand alternative energy sources including solar and wind energies.
Finite Element Analysis	CO1	Explain variational principles, Galerkin's methods for finite element formulation. Compare FEM methods with other methods like FDM, FVM.
	CO2	Explain fundamental relations of elasticity, interpolation functions, formulation and assembly of matrices, solving system of linear equations.
	CO3	Analyze bar and truss problems without and with midside nodes. Analyze beam problems using Hermite shape functions.
	CO4	Analyze plane stress, plane strain and axisymmetric (2D) models. Also analyze 2D isoparametric problems, and 3D problems using tetrahedron element.
	CO5	Solve scalar field problems like 1D, 2D heat conduction fin problems, and torsion problems.
	CO6	Calculate natural frequencies and mode shapes of vibration using dynamic FEA using consistent mass matrix.
Computational Fluid Dynamics	CO1	Compare FD, FE, FV methods. Classify partial differential equations. Solve system of linear algebraic equations using direct and iterative approaches.
	CO2	Solve steady state and unsteady heat transfer problems using both explicit and implicit finite difference methods like Crank-Nicholson and ADI-ADE.
	CO3	Derive the basic rules for control volume approach using 1D steady heat conduction equation. Extend this to 2D & 3D steady and unsteady heat conduction problems.
	CO4	Apply finite volume method to problems containing both convection and diffusion. Assess various discretization schemes and treatment of boundary conditions.

	CO5	Formulate governing equations using stream function-vorticity method. Solve pressure-velocity coupled problems using SIMPLE and SIMPLER algorithms.
	CO6	Solve turbulent flows including direct numerical simulation, large eddy simulation, RANS models. Understand pressure-velocity-density coupling in compressible flows.
Equipment Design for Thermal Systems	CO1	Classify various heat exchangers. Understand recuperation and regeneration.
	CO2	Perform heat exchanger design calculations using LMTD and NTU methods for various flow configurations.
	CO3	Perform design calculations on double pipe and shell & tube heat exchangers.
	CO4	Calculate condensation properties of single vapors in various types of condensers like horizontal, vertical, desuper heater type.
	CO5	Describe vaporizing processes occurring in both forced and natural circulation vaporizing exchanger. Calculate efficiencies for different types of fins.
	CO6	Analyze and design cooling towers including performance, heat balance, number of diffusion units required calculations.
Convective Heat Transfer	CO1	Derive equations of continuity, momentum and energy. Derive both laminar and turbulent boundary layer equations using differential and integral equations.
	CO2	Solve governing equations for external laminar and turbulent forced convection flows over a flat plate with viscous dissipation effects.
	CO3	Solve governing equations for internal laminar and turbulent flows in pipes and ducts with developing velocity and temperature fields.
	CO4	Develop and solve governing boundary layer equations for free convective laminar and turbulent flows through a vertical channel and horizontal enclosure.
	CO5	Develop and solve governing boundary layer equations for combined convection of external and internal flows.
	CO6	Analyze convective heat transfer through porous media including boundary layer solutions for 2D forced convection, and natural convection.
Thermal & Nuclear Power Plants	CO1	Perform volumetric, gravimetric and flue gas analysis on combustion of coal.
	CO2	Understand working of a steam power plant including subsystems like fuel handling, boilers, ash handling, cooling towers, turbines and condensers.
	CO3	Perform thermal analysis of combined cycle gas turbine power plant including cogeneration, waste heat recovery, fluidized bed combustion and IGCC power plants.
	CO4	Describe methods of enriching uranium, applications, safety, economics and future of nuclear power plants.

	CO5	Perform economics of power generation including load factor, utilization factor, economic load sharing, depreciation, specific economic energy.
	CO6	Describe various pressure, temperature and flow measuring instruments. Analyze combustion gases for pollutants.
Thermal Measurements Process Controls	CO1	Understand general concepts in measuring instruments including static and dynamic characteristics.
	CO2	Understand various static and dynamic, vacuum, low and high pressure measuring instruments.
	CO3	Understand various flow measuring devices like obstruction meters, pressure probes, thermal anemometers, compressible fluid flow measurement instruments.
	CO4	Understand various temperature measuring instruments like thermometers, thermocouples, pyrometers.
	CO5	Understand various instruments that measures fluid level, density, velocity, viscosity, moisture content, humidity, thermal conductivity.
	CO6	Understand process control design tools like transfer functions, signal flow graphs. Evaluate control system stability using steady state and transient regulations.
Refrigeration & Air-Conditioning	CO1	Describe basic elements of vapour compression system like condenser, evaporator, expansion valve and refrigerant. Calculate performance and load balancing.
	CO2	Explain the principle of compound compression using multi-evaporator and multi-stage systems using flash inter-cooling.
	CO3	Describe low temperature production systems like liquefaction, cascade and dry ice systems. Understand vapor absorption system.
	CO4	Explain the working principle, calculations of air, steam jet and unconventional refrigeration systems like thermo-electric, vortex tube, pulse tube.
	CO5	Understand requirements of comfort air-conditioning. Perform cooling load estimation under various conditions.
	CO6	Calculate bypass factor, ADP, RSHF, ESHF, GSHF for different air-conditioning systems like fresh air, recirculated air, reheat systems.
JET Propulsion & Rocketry	CO1	Perform gas turbine cycle thermodynamic analysis including on compressors and turbines, blade aerodynamics.
	CO2	Understand fundamentals of jet propulsion, and classify them into turbojet, turbofan, turboprop, rocket, ramjet engines.
	CO3	Conduct performance analysis on subsonic and supersonic nozzles.
	CO4	Explain aero-thermo chemistry of combustion products. Describe composition and manufacturing methods of solid propellants.
	CO5	Perform design calculations for solid rocket motor design. Design injectors, propellant tank, pump and pressure feed systems, combustion chamber that uses liquid propellants.
	CO6	Design ramjet and integral rocket ramjet propulsion system for critical, super-critical and sub-critical operation of air intake.
Computational Methods Lab	CO1	Design discretized models of various structures and components used in fluid mechanics and heat transfer.

	CO2	Solve problems related to fluid laminar and turbulent flows using computational fluid dynamics software package.
	CO3	Perform various analyses for the modes of heat transfer in different structures and components.
	CO4	Write C/Matlab Programs to solve differential equations using numerical methods.
	CO5	Design discretized models of various structures and components used in fluid mechanics and heat transfer.
	CO6	Solve problems related to fluid laminar and turbulent flows using computational fluid dynamics software package.
Computational Methods Lab	CO1	Solve single variable non-linear unconstrained optimization problems using elimination, interpolation and gradient-based methods..
	CO2	Calculate optimum solution of unconstrained and constrained geometric programming problems.
	CO3	Perform multi-stage decision processes using dynamic programming including applications like inventory, allocation, replacement.
	CO4	Conduct sensitivity analysis of multi-variable linear programming problems. Perform Monte-Carlo simulation on inventory, queuing problems.
	CO5	Solve integer programming optimization problems using Gomory's cutting plane and branch and bound methods.
	CO6	Perform stochastic linear dynamic programming problems using probability theory.

DEPARTMENT OF MBA AY: 2017-18

PROGRAM OUTCOMES	
PO1	Develop a firm level of understanding of the key functions of business – accounting, finance, management, marketing, management information systems, the global economy, and operations management.
PO2	Integrate core business knowledge and apply that knowledge in the analysis and decisions-making process.
PO3	Design and construct models, components, or processes as per needs and specifications in the modern business world.
PO4	Increase efficiency and proficiency in collecting data, analyze and present appropriate research reports.
PO5	Use the techniques, skills, and modern hardware and software tools necessary for taking and implementing managerial decisions.
PO6	Create an ability to understand professional and social responsibility by identifying and enhancing knowledge in contemporary issues.
PO7	Create an ability to understand of global environment and its impact on people, businesses and the economy.
PO8	Recognize and address the ethical issues & values prevailing in the business environment.
PO9	Apply conceptual knowledge for good decision making for both individual and group by using case analysis, projects and assignments.
PO10	Implement leadership skills through effective communication.

PO11	Create an ability to understand the impact of managerial solutions in a global, economic, environmental, and societal context.
PO12	Ensure holistic development of students by recognizing the need for, and creating an ability to engage in life-long learning.

PROGRAM SPECIFIC OUTCOMES	
PSO1	Formulate an integrative business project through the application of multidisciplinary knowledge comprising of accounting, finance, operations, management information system, marketing and human resources management.
PSO2	Employ financial decision models to select appropriate projects for a business enterprise and manage firm growth through strategies such as mergers, acquisitions, international expansion, and new venture development.

COURSE OUTCOMES		
Course Title		**Description of the Course Outcome**
MANAGEMENT THEORY AND PRACTICE	CO1	Helps the student to learn how to practice Management concepts and functions.
	CO2	Facilitates the students to gain practical knowledge in Decision Making, Delegation of Authority, decentralisation and departmentation.
	CO3	Enables the students to become skilled at how to manage the conflicts and improve the negotiation skills.
	CO4	Emphasizes on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
	CO5	Assess managerial practices and choices relative to ethical principles and standards.
	CO6	Specify how the managerial tasks of planning, organizing, and controlling can be executed in a variety of circumstances.
MANAGERIAL ECONOMICS	CO1	Help Students to learn the overview of Managerial Economics.
	CO2	Help Students' to understand the Principles of Demand and its practical Applications.
	CO3	Familiarize Students' with cost-output relationship in the short run and long run.
	CO4	Enable Students to understand Price-Output determination in Perfect competition
	CO5	Familiarize Students' with Profit Theories and its practical applications
	CO6	Emphasize on developing analytical skills, presentation skills and problem solving skills by discussing relevant case studies in the class room.
FINANCIAL ACCOUNTING AND ANALYSIS	CO1	Understand the basic knowledge of bookkeeping and accounting.
	CO2	Learn the accounting cycle, final accounts preparation.
	CO3	Learn depreciation methods, inventory valuation.
	CO4	Understand issue of shares, forfeiture, re-issue, Amalgamation, absorption, reconstruction.

AND ANALYSIS	CO5	Understand financial statement analysis.
	CO6	Emphasize on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
BUSINESS COMMUNICATION	CO1	Help students to learn the overview of Organizational Communication
	CO2	Helps in improvement of the behavioral, listening, perceiving skills in organizational context.
	CO3	Application of major theories of communication in organizations from three perspectives: traditional, interpretive, and critical.
	CO4	Able to criticize past and current practices involving organizational culture, technology, diversity, and leadership in organizations.
	CO5	Analyze both internal and external organizational communication trends.
	CO6	Emphasize on developing analytical skills, presentation skills and problem-solving skills by discussing relevant case studies in the class room.
BUSINESS AND LEGAL ENVIRONMENT	CO1	Help Students to learn the Overview of Business and Legal Environment.
	CO2	Familiarize Students with Nature and significance of Business Environment
	CO3	Enable Students to understand The Indian Contracts Act, 1872
	CO4	Enable Students to understand Special Contract and Agency Rights in Business.
	CO5	Help Students to understand the concept of the Sales of Goods Act 1940 and The Negotiable Instruments Act, 1881.
	CO6	Emphasize on developing analytical skills, presentation skills, and problem solving skills by discussing relevant case studies in the class room.
QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS	CO1	Learn the course combines mathematical concepts and the use of software in an integrated way.
	CO2	Clearly identify an otherwise unstructured business problem and its components.
	CO3	Employ effective techniques for addressing the major challenges presented.
	CO4	Provide a solution to the decision process.
	CO5	Develop this course is intended to provide students with basic knowledge of analyzing data using Various statistical techniques whose final goal is to enable better reporting for decision be discussed in each unit.
ORGANIZATIONAL BEHAVIOR	CO1	Students will be able to understand the overview of Organizational behavior and its importance.
	CO2	Students will be able to develop a deep understanding about Personality and Attitude and its implications in Individuals and at Organizations.
	CO3	Students will be able to understand comprehensively the theories of motivation and its implications in Individuals and at Organizations.
	CO4	Students will be able to understand comprehensively the theories of Learning and its implications in Individuals and at Organizations.

	CO5	Students will be able to help Students to comprehend the theories of Stress and Conflict, Emotions and Subjective Well-being.
	CO6	Students will be able to emphasize on developing analytical skills, presentation skills, and problem solving skills by discussing relevant case studies in the class room.
BUSINESS COMMUNICATION SKILLS LAB	CO1	Help Students to learn how to speak and write good English.
	CO2	To train them to use language effectively to face interviews, group discussions, public speaking.
	CO3	To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.
	CO4	However, depending upon the available of infrastructure and budget, the above targets can also be achieved by procuring the minimum required equipment suggested for the establishment of Conventional Lab the details of which are given below. The lab should cater to the needs of the students to build up their confidence to help them develop leadership qualities through their communicative competence.
FINANCIAL MANAGEMENT	CO1	Help Students to learn the overview of Financial Management.
	CO2	Understand the time value of money.
	CO3	Develop problem solving and prompt decision making for long term projects.
	CO4	Define and describe the process and the practice of financial planning.
	CO5	Student can able to understand effective credit management.
	CO6	Emphasize on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
MARKETING MANAGEMENT	CO1	Students will be able to learn the overview of Marketing Management.
	CO2	Students will be able to develop a sound knowledge of conventional marketing ideas, and of the theories on which these theories are based.
	CO3	Students will be able to develop practices in defining and working out integrated marketing and communication strategies.
	CO4	The students can able to act autonomously in planning, implementing and reflecting at a professional level, on the development and use of marketing strategies to address organizational problems.
	CO5	Students will be able to emphasize on developing analytical skills, presentation skills and problem-solving skills by discussing relevant case studies in the class room.
HUMAN RESOURCE MANAGEMENT	CO1	Help Students to learn Definition, Nature and Scope and total concept of HRM.
	CO2	Help Students to understand the Principles of HRM and its practical Applications.
	CO3	Enable Students to understand duties & responsibilities of the manager.
	CO4	Enable Students to understand and implement Manpower planning, uses, benefits, problems and limitations.

	CO5	Help Students to understand 'the compensation and benefits administration' along with importance of performance, Industrial Relations, Trade Unions and resolution of disputes.
	CO6	Enables to understand functions in HR department and different style of organization.
PRODUCTION & OPERATIONS MANAGEMENT	CO1	Help Students to learn the Overview of Production and Operations Management.
	CO2	Familiarize Students with Production planning and control in different production systems.
	CO3	Help Students to understand the concept of productivity, Work Study, Method Study and Work Sampling.
	CO4	Enable Students to understand the concepts of EOQ and other inventory control techniques.
	CO5	Enable Students to understand Quality Standards ,ISO 9000, Six Sigma etc. and Quality control,Total Quality Management, and compute control charts.
	CO6	Emphasize on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
COST AND MANAGEMENT ACCOUNTING	CO1	Help Students to learn the overview of Cost and Management Account
	CO2	Demonstrate an understanding of the various types of costs which a business incurs
	CO3	Understand the significance of calculating the break-even point
	CO4	Select activity-based performance measures to manage cost, time and other sources of customer value;
	CO5	Emphasize on developing analytical skills, presentation skills, and problem solving skills by discussing relevant case studies in the class room
BUSINESS RESEARCH METHODS & COMPANY AND INDUSTRY ANALYSIS	CO1	Help students to learn an overview of Business Research Methods.
	CO2	Conduct a preliminary literature review of the concepts comprising the research questions
	CO3	Set out the main elements of a potential research instrument for testing the hypotheses, including a critical and comparative analysis of the proposed instrument
	CO4	Understand how to classify , interpret and present data
	CO5	Prepare a mini-dissertation research proposal / a research plan
	CO6	Emphasize on developing analytical skills, presentation skills and problem solving skills by discussing relevant case studies in the class room.
RETAIL MANAGEMENT	CO1	Help Students to learn the Overview retail management of India and the World.
	CO2	Familiarize Students with an idea on retail strategy and retail formats.
	CO3	Enable the students to identify the selection of location and opportunity of retail industry.
	CO4	Help Students to understand the concept of shopping environment.
	CO5	Enable Students to understand the concepts of functions, retail operation and future of retailing.

	CO6	Help Students to understand the concept of pricing policies and supply chain management of retail management.
INFORMATION TECHNOLOGY LAB	CO1	Help Students to learn the Overview of Information Technology.
	CO2	Demonstrate proficiency in Microsoft Office and Windows File Management, as well as digital literacy.
	CO3	Help students to learn applications of MS project mathematical simulations.
	CO4	Help students to participate online trading on different products of SEBI & other financial institutions
	CO5	Help students to learn applications of database management concepts.
	CO6	Emphasize on developing analytical skills, presentation skills, and problem solving skills by hands on experience the IT Lab.
STRATEGIC MANAGEMENT	CO1	To sharpen students abilities to think critically, logically and strategically
	CO2	To help them learning to diagnose situations from a strategic perspective and practice SWOT analysis
	CO3	To develop analytical and decision making skills to implement the chosen strategy.
	CO4	To bridge the gap between theory & practice by developing an understanding of when and how to apply the earlier learned topics on marketing, finance, HRM, and production management.
	CO5	Identify the strategic problems of a firm and develop ethical solutions to those problems.
	CO6	Emphasizing on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
COST AND MANAGEMENT ACCOUNTING	CO1	Help Students to learn the overview of Cost and Management Account
	CO2	Demonstrate an understanding of the various types of costs which a business incurs
	CO3	Understand the significance of calculating the break-even point
	CO4	Select activity-based performance measures to manage cost, time and other sources of customer value
	CO5	Emphasize on developing analytical skills, presentation skills, and problem solving skills by discussing relevant case studies in the class room.
MANAGEMENT OF INFORMATION SYSTEMS (MIS)	CO1	Help Students to learn the overview of Management Information Systems.
	CO2	Students will able to adapt an experiential learning perspective in the stream of information technology.
	CO3	Students will be able to create and expand an interface between human intelligence systems to an artificial intelligence system.
	CO4	Students will be able to act autonomously in planning, implementing and reflecting at a professional level, on the development and use of technology to address organizational problems.

	CO5	Emphasize on developing analytical skills, presentation skills, and problem solving skills by discussing relevant case studies in the class room.
CONSUMER BEHAVIOUR & CUSTOMER RELATIONSHIP MANAGEMENT	CO1	Students will be able to learn the overview of Consumer Behaviour and Customer Relationship Management.
	CO2	Students will be able to acquire an understanding of the psychological processes that underlie the effectiveness of marketing strategy in terms of impact on consumer behavior.
	CO3	Students will be able to do critical assessment of current and future metrics, research technologies and research data output with relation to CRM.
	CO4	Students will be able to emphasize on developing analytical skills, presentation skills, and problem solving skills by discussing relevant case studies in the class room.
ADVERTISEMENT AND BRAND MANAGEMENT	CO1	To Aid students to put on the practical disclosure on advertising management in a developing economy.
	CO2	To adjoin some practical assignments with reference to the making of advertisements in different Medias for better understanding of the concept.
	CO3	To help students to gain knowledge on advertising management in various industries
	CO4	To help Students to evaluate how Advertisement effectiveness and measurements are deliberated by the companies
	CO5	To enable Students to learn practically Brand equity, Brand Extensions,. Brand Revitalization and Elimination and Brand valuation.
	CO6	To enable Students to prepare and solve cases so as to bridge the gap between theory and practicability.
INVESTMENT MANAGEMENT	CO1	Help students to learn an overview of investment management
	CO2	Analyze the major investment instruments.
	CO3	Explain the roles and workings of the securities markets locally and abroad.
	CO4	Evaluate the factors influencing investment decisions.
	CO5	Apply basic portfolio theory to managing investment portfolios.
	CO6	Apply portfolio and capital market theories in investment analysis and decisions in a practical setting.
	CO7	Evaluate and design appropriate portfolio management strategies to meet investors‘ objectives and needs.
	CO8	Emphasize on developing analytical skills , presentation skills and problem solving skills by discussing relevant case studies in the class room.
FINANCIAL INSTITUTIONS AND SERVICES	CO1	Help Students to learn the overview of financial institutions and services.
	CO2	Help Students‘ to understand the stock exchange operations and roles.
	CO3	Familiarize Students‘ with merchant banking mechanism and problems.
	CO4	Enable Students to understand credit rating mechanism.
	CO5	Familiarize Students‘ with dmat services and its companies.

	CO6	Emphasize on developing analytical skills, presentation skills and problem solving skills by discussing relevant case studies in the class room.
STRATEGIC HUMAN RESOURCE MANAGEMENT	CO1	Help Students to learn the Overview of Strategic Human Resource Management.
	CO2	Familiarize Students with Investment perspectives of Human Resource.
	CO3	Help Students to Manage Strategic Organizational Renewal, Managing Change and OD. Enable Students to understand the concepts of Establishing Strategic pay plans, Determining periods and Establishing periods
	CO4	Enable Students to understand Managing Global Human Resources and the Internationalization of Business and Multinational, Global, and Transnational Strategies.
	CO5	Emphasize on developing analytical skills, presentation skills, and problem solving skills by discussing relevant case studies in the class room.
MANAGEMENT OF INDUSTRIAL RELATIONS	CO1	Students will be able to learn the overview of Industrial Relations Management.
	CO2	Students will be able to familiarize with Economic, Social and Political environments.
	CO3	Students will be able to understand the concept of Union-Management Relations
	CO4	Students will be able to appreciate and analyze the concepts of Labor Welfare and Social Security Acts.
	CO5	Students will be able to appreciate Discipline and Grievance Management Procedures followed in the industry.
	CO6	Students will be able to comprehend the Emerging Industrial Relations Scenario aligned with ILO.
	CO7	Students will be able to emphasize on developing analytical skills, presentation skills, and problem solving skills by discussing relevant case studies in the class room.
RISK MANAGEMENT	CO1	Help Students to learn the overview of Risk Management.
	CO2	Identify and explain features of private and public insurance available to meet each identified need.
	CO3	Demonstrate the ability to appropriately select from available products to meet clients‘ needs.
	CO4	Integrate the tax implications into insurance decisions.
	CO5	Incorporate employee benefits into financial planning recommendations.
	CO6	Emphasize on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
INSURANCE LAWS	CO1	Help Students to learn the overview of Insurance Laws.
	CO2	Understand basic legal concepts and general principles of law;
	CO3	Gain knowledge and understanding of the laws relevant to insurance;
	CO4	Gain knowledge and understanding of the system which applies these laws; and Develop an analytical approach to the application of knowledge and skills to simple problems.

	CO5	Emphasize on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
DATA WAREHOUSING AND DATA MINING	CO1	Help students to learn the overview of Data Warehousing and Data Mining.
	CO2	Demonstrate the knowledge gained through solving problems particularly in the time of project so that project inception of data processing and analysis kind of work is transformed to better in elaboration and implementation phase during department level presentation. (PO_A,C)
	CO3	Use of data mining tools during Projects to build reliable products, the current demand of the industry. (PO_D)
	CO4	Emphasize on developing analytical skills, presentation skills and problem-solving skills by discussing relevant case studies in the class room.
E-COMMERCE	CO1	Help students to learn the overview of E-Commerce.
	CO2	Understand the process of setting up an interactive web site, displaying product catalogue, deploying shopping carts, handling credit card transaction.
	CO3	Students will be able to evaluate the information needs and requirements of a business entity wishing to adhere to ecommerce paradigm.
	CO4	Students will be aware of security issues and of technologies designed to ensure secure transactions.
	CO5	Emphasize on developing analytical skills, presentation skills and problem-solving skills by discussing relevant case studies in the class room.
PRE-PLACEMENT TRAINING	CO1	Individual Evaluation conducted on al the above topics and modules
	CO2	Score Card & HR Evaluation Form copies shared with the institute.
	CO3	Every Participating Student has to complete all the modules to be eligible for receiving the ―Training Certificate‖ which wil be graded.
BUSINESS ETHICS AND CORPORATE GOVERNANCE	CO1	To Help Students to learn the overview of Corporate Governance and Business Ethics.
	CO2	To Promote understanding of the importance, for business and the community, of ethical conduct;
	CO3	To Provide the skills with which to recognise and resolve ethical issues in business;
	CO4	To enhance awareness and critical self-examination of one's own values, and to appreciate the relevance of personal values in the business/workplace setting.
	CO5	To Emphasize on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
ENTREPRENEURIAL DEVELOPMENT	CO1	Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
	CO2	Understanding Entrepreneurship Development programmes in INDIA and contents for training for Entrepreneurial competencies.

DEVELOPMENT	CO3	Create appropriate business model and develop well presented business plan that is feasible for the student.
	CO4	Understanding how to manage effectively the selected business.
LOGISTICS & SUPPLY CHAIN MANAGEMENT	CO1	Students will be able to learn the overview of Logistics & Supply Chain Management.
	CO2	Students will be able to transform themselves from a theoretical learning perspective to an experiential learning perspective in the arena of Logistics & Supply Chain Management.
	CO3	Students will be able to synthesize the management issues involved in logistics decision making at contemporary scenario of business.
	CO4	Students will be able to evaluate the strategic issues in logistics and supply chain management.
	CO5	Students will be able to analyze the key aspects of logistics by integrating the inbound and outbound logistics in global context.
	CO6	Students will be able to emphasize on developing analytical skills, presentation skills and problem-solving skills by discussing relevant case studies in classroom.
INTERNATIONAL MARKETING	CO1	Help Students to learn the overview of International Marketing.
	CO2	Help Students‘ to understand the International Market Environment.
	CO3	Familiarize Students‘ with International market research.
	CO4	Enable Students to understand the International product and brand management.
	CO5	Familiarize Students‘ with International distribution strategies.
	CO6	Familiarize the students with the concept of pricing and promotion strategies of International market.
	CO7	Emphasizing on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
RETAIL MANAGEMENT AND SERVICE MARKETING	CO1	Help Students to learn the Overview retail management of India and the World.
	CO2	Familiarize Students with an idea on retail strategy and retail formats.
	CO3	Enable Students to understand the concepts of delivery process of retailing.
	CO4	Help students to learn the overview of Service Marketing.
	CO5	Enable Students to understand the pricing strategies of service marketing.
	CO6	Familiarize Students‘ with planning and managing of delivery of strategies in service marketing.
	CO7	Emphasizing on developing analytical skills, presentation skills, and problem solving skills by discussing relevant case studies in the class room.
INTERNATIONAL FINANCIAL MANAGEMENT	CO1	Understand the international financial management and International monetary system.
	CO2	Describe how foreign exchange rate markets work, various exchange rate theories, currency features & Options.
	CO3	To Understand International short term & long term asset-liability management.

MANAGEMENT	CO4	Emphasize on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
	CO5	The pre requisite to the course is Financial Accounting & Analysis & Financial Management.
FINANCIAL RISK MANAGEMENT	CO1	Help students to learn an overview of Financial Risk Management.
	CO2	Describe and analyse the global and domestic financial Risk faced by investors.
	CO3	Understand and apply different Financial Derivatives.
	CO4	Explain different financial derivatives and critique their relevance in the real world economy.
	CO5	Summarise and critique the importance of financial risk Making and Selecting a portfolio under uncertain environment.
	CO6	Emphasize on developing Techniques and Tools of Risk Management by discussing relevant case studies in the class room.
GLOBAL HUMAN RESOURCE MANAGEMENT	CO1	Demonstrate across a broad knowledge of HRM strategies, Polices and practices across a range of cultural and nations.
	CO2	Understand and identify the differences between the intentional and domestic dimension of the operational aspects of HRM including recruitment and selection, training and development, payment systems, performance management and industrial relations.
	CO3	Demonstrate and understanding of the management of expatriate employees and the problems that confront expatriate management
	CO4	To analysis, apply and reflect on international HRM activates in relation to global ethical issues in the work place
	CO5	Enhance their critical thinking theorizing and synthesizing abilities and apply them to problem solving in the field of managing people internationally and domestically.
PERFORMANCE MANAGEMENT	CO1	Students will be able to learn the overview of Performance Management.
	CO2	Students will be able to explore the horizon of performance management and linkage with Human Resource Department.
	CO3	Students will be able to articulate the importance of performance management linked with HR department.
	CO4	Students will be able to integrate performance management for Career Advancement and Organizational Development.
	CO5	Students will be able to appraise the methods and tools for performance management. Students will be able to develop performance appraisal methods aligned with the HR Department.
	CO6	Emphasize on developing analytical skills, presentation skills and problem-solving skills by discussing relevant case studies in the class room.
BANKING LAWS	CO1	Help Students to learn the overview of Banking Laws.
	CO2	Recognise and explain the basis of general law that affects banks, particularly contract law
	CO3	Demonstrate an understanding of the bank-customer relationship
	CO4	Distinguish between the legal structures of the various types of retail and business Customers.

	CO5	Emphasize on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
CLAIMS MANAGEMENT	CO1	Help Students to learn the overview of Claims Management.
	CO2	Identify information that is required to properly substantiate and justify entitlement.
	CO3	How that information should be presented
	CO4	What methods of evaluation are available and when it would be appropriate to use them.
	CO5	Emphasize on developing analytical skills, presentation skills, problem solving skills by discussing relevant case studies in the class room.
SYSTEMS AUDIT	CO1	Help students to learn the overview of Systems Audit.
	CO2	Able to apply the concept of audit in managing information systems
	CO3	Develops the ability to conduct group works and solve related problems
	CO4	Able to rationalize in a critical environment related with different issues to audit and control.
	CO5	Emphasize on developing analytical skills, presentation skills and problem-solving skills by discussing relevant case studies in the class room.
DECISION SUPPORT SYSTEMS	CO1	Help students to learn the overview of Decision Support Systems.
	CO2	Ability to select appropriate modeling techniques for supporting semi-structured business decision making.
	CO3	Ability to identify and select appropriate decision support systems for generating innovative business solutions.
	CO4	Ability to design and implement decision support systems for generating innovative business solutions.
	CO5	Emphasize on developing analytical skills, presentation skills and problem-solving skills by discussing relevant case studies in the class room.
PROJECT REPORT	CO1	Student can able to understand effective utilizalation of their specialization and gain practical knowledge from industry,