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Computer Science and Engineering Course Outcomes

for the Academic Year 2023-2024

Computer Science and Engineering I&II Sem Course Outcomes for the Academic Year			
S.No.	Year/Sem	Course Name	Course Outcomes
1	I/I	**Communicative English**	**CO1**: understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information
			CO2: ask and answer general questions on familiar topics and introduce oneself/others
			CO3: employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information
			CO4: recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
			CO5: form sentences using proper grammatical structures and correct word forms
2	I/I	**Mathematics -I**	**CO1:** utilize mean value theorems to real life problems (L3)
			CO2: solve the differential equations related to various engineering fields (L3)
			CO3: familiarize with functions of several variables which is useful in optimization (L3)
			CO4: apply double integration techniques in evaluating areas bounded by region (L3)
			CO5: students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems(L5)
3	I/I	**Applied Physics**	**CO:1** Explain the need of coherent sources and the conditions for sustained interference (L2).
			Identify the applications of interference in engineering (L3).
			Analyze the differences between interference and diffraction with applications (L4).

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			Illustrate the concept of polarization of light and its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2) .
			CO:2 Explain various types of emission of radiation (L2). Identify the role of laser in engineering applications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based on refractive index profile and mode of propagation (L2). Identify the applications of optical fibers in medical, communication and other fields (L2). Apply the fiber optic concepts in various fields (L3).
			CO:3 Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identify the role of Schrodinger's time independent wave equation in studying particle in onedimensional infinite potential well (L3). Identify the role of classical and quantum free electron theory in the study of electrical conductivity (L3). Classify the energy bands of solids (L2)
			CO:4 Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based on susceptibility and their temperature dependence (L2). Explain the applications of dielectric and magnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)
			CO:5 Outline the properties of charge carriers in semiconductors (L2).

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			Identify the type of semiconductor using Hall effect (L2).
			Identify applications of semiconductors in electronic devices (L2).
			Classify superconductors based on Meissner's effect (L2).
			Explain Meissner's effect, BCS theory & Josephson effect in superconductors (L2).
4	I/I	**Programming for Problem Solving using C**	**CO:1** To write algorithms and to draw flowcharts for solving problems
			CO:2 To convert flowcharts/algorithms to C Programs, compile and debug programs
			CO:3 To use different operators, data types and write programs that use two-way/ multi-way selection
			CO:4 To select the best loop construct for a given problem
			CO:5 To design and implement programs to analyze the different pointer applications
			CO:6 To decompose a problem into functions and to develop modular reusable code
			CO:7 To apply File I/O operations
5	I/I	**Computer Engineering Workshop**	**CO1:** Assemble and disassemble components of a PC
			CO2: Construct a fully functional virtual machine, Summarize various Linux operating system Commands
			CO3: Recognize characters & extract text from scanned images, Create audio files and podcasts.
6	I/I	**English Communication Skills Laboratory**	**CO1:** Better pronunciation and accent
			CO2: Ability to use functional English
			CO3: Competency in analytical skills and problem solving skills
7	I/I	**Applied Physics Lab**	**CO1:** Demonstrate the concepts of physics experimentally with physical equipment.
			CO2: Summarize the required data to perform experiments related to

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engineering physics.

			CO3: Calculate the physical values with targeted accuracy by explaining the basic knowledge, principles, and concepts of physics using required instruments.
6	I/I	**Programming for Problem Solving using C Lab**	**CO1:** Gains Knowledge on various concepts of a C language.
			CO2: Able to draw flowcharts and write algorithms.
			CO3: Able design and development of C problem solving skills.
			CO4: Able to design and develop modular programming skills.
			CO5: Able to trace and debug a program
7	I/II	**Mathematics – II**	**CO1:** develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
			CO2: solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
			CO3: evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
			CO4: apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
			CO5: apply numerical integral techniques to different Engineering problems (L3)
			CO6: apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)

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8	I/II	**Applied Chemistry**	**CO1:** Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
			CO2: Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.
			CO3: Synthesize nanomaterials for modern advances of engineering technology.
			CO4: Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.
			CO5: Analyze the principles of different analytical instruments and their applications.
			CO6: Design models for energy by different natural sources.
			CO7: Obtain the knowledge of computational chemistry and molecular machines
9	I/II	**Computer Organization**	**CO1:** Demonstrate and understanding of the design of the functional units of a digital computer system.
			CO2: Relate Postulates of Boolean algebra and minimize

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			combinational functions
			CO3: Recognize and manipulate representations of numbers stored in digital computers
			CO4: Build the logic families and realization of logic gates.
			CO5: Design and analyze combinational and sequential circuits
			CO6: Recall the internal organization of computers, CPU, memory unit and Input/Outputs and the relations between its main components
			CO7: Solve elementary problems by assembly language programming
10	I/II	**Python Programming**	**CO1:** Develop essential programming skills in computer programming concepts like data types, containers
			CO2: Apply the basics of programming in the Python language
			CO3: Solve coding tasks related conditional execution, loops
			CO4: Solve coding tasks related to the fundamental notions and techniques used in objectoriented programming
11	I/II	**Data Structures**	**CO1:** Summarize the properties, interfaces, and behaviors of basic abstract data types
			CO2: Discuss the computational efficiency of the principal algorithms for sorting & searching
			CO3: Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writing programs
			CO4: Demonstrate different methods for traversing trees

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12	I/II	**Applied Chemistry Lab**	**CO1:** Student will know structure property relationship and corrosion.
			CO2: Student will know the use of water as an engineering material, its properties and applications.
			CO3: Student will generate usefulness and apply the various instrumental techniques for identification and characterization of materials
			CO4: Student will understand the various types of fuels and combustion.
			CO5: Student will know the types, properties and applications of polymers and nanomaterials.
13	I/II	**Python Programming Lab**	**CO1:** Develop essential programming skills in computer programming concepts like data types, containers
			CO2: Apply the basics of programming in the Python language
			CO3: Solve coding tasks related conditional execution, loops
			CO4: Solve coding tasks related to the fundamental notions and techniques used in objectoriented programming
14	I/II	**Data Structures Lab**	**CO1:** Use basic data structures such as arrays and linked list.
			CO2: Programs to demonstrate fundamental algorithmic problems including Tree. Traversals, Graph traversals, and shortest paths.
			CO3: Use various searching and sorting algorithms.

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			CO1:. Classify object oriented programming and procedural programming

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15	II/I	OBJECT ORIENTED PROGRAMMING THROUGH C++	**CO2:**. Apply C++ features such as composition of objects, operator overloads, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling
			CO3:. Build C++ classes using appropriate encapsulation and design principles
			CO4: Apply object oriented or non-object oriented techniques to solve bigger computing problems
16	II/I	OPERATING SYSTEMS	**CO1:** Describe various generations of Operating System and functions of Operating System
			CO2: Describe the concept of program, process and thread and analyze various CPU Scheduling Algorithms and compare their performance
			CO3: . Solve Inter Process Communication problems using Mathematical Equations by various methods
			CO4: . Compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques
			CO5: . Outline File Systems in Operating System like UNIX/Linux and Windows
17	II/I	SOFTWARE ENGINEERING	**CO1:** Ability to transform an Object-Oriented Design into high quality, executable code
			CO2: Skills to design, implement, and execute test cases at the Unit and Integration level
			CO3: Compare conventional and agile software methods

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18	II/I	**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**	**CO1:** Comprehend mathematical principles and logic
			CO2: Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
			CO3:. Manipulate and analyze data numerically and/or graphically using appropriate Software
19	II/I	**MATHEMATICS - III**	**CO1:** Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
			CO2: Estimate the work done against a field, circulation and flux using vector calculus (L5)
			CO3: Apply the Laplace transform for solving differential equations (L3)
			CO4: Find or compute the Fourier series of periodic signals (L3)
			CO5: Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
			CO6: . Identify solution methods for partial differential equations that model physical processes (L3)
20	II/I	**CONSTITUTION OF INDIA**	**Co1:** Understand historical background of the constitution making and its importance for building a democratic India..
			CO2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
			CO3: Understand the value of the fundamental rights and duties

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			for becoming good citizen of India.
			CO4: Analyze the decentralization of power between central, state and local self- government
			CO5: Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.
21	II/I	**OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB**	**CO1:** Apply the various OOPs concepts with the help of programs
22	II/I	**OPERATING SYSTEM LAB**	**CO1:** To use the Unix file system and file access control
			CO2: To use of an operating system to develop software
			CO3: Students will be able to use Linux environment efficiently
			CO4: Solve problems using bash for shell scripting .
23	II/I	**SOFTWARE ENGINEERING LAB**	**CO1:** By the end of this lab the student is able to elicit, analyze and specify software requirements through a productive working relationship with various stakeholders of the project

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			CO2: . prepare SRS document, design document, test cases and software configuration management and risk management related document
			CO3: develop function oriented and object oriented software design using tools like rational rose.
			CO4:use modern engineering tools necessary for software project management, estimations, time management and software reuse
			CO5: generate test cases for software testing
24	II/I	**WEB APPLICATION DEVELOPMENT USING FULL STACK** Frontend Development – Module -I	**CO1**: Analyze a web page and identify its elements and attributes.
			CO2: Demonstrate the important HTML tags for designing static pages and separate design from content using Cascading Style sheet
			CO3: Implement MVC and responsive design to scale well across PC, tablet and Mobile Phone
			CO4. Create web pages using HTML and Cascading Style Sheets
25	II/II	**PROBABILITY AND STATISTICS**	**CO1:** Classify the concepts of data science and its importance (L4) or (L2)
			CO2 Interpret the association of characteristics and through correlation and regression tools (L4)
			CO3 Make use of the concepts of probability and their applications (L3)
			CO4: Apply discrete and continuous probability distributions (L3) and event handling
			CO5: Design the components of a classical hypothesis test (L6)

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			CO6: Infer the statistical inferential methods based on small and large sampling tests (L4)
26	II/II	**DATABASE MANAGEMENT SYSTEMS**	**CO1:** Describe a relational database ▢and object-oriented database
			CO2: . Create, maintain and ▢manipulate a relational database using SQL
			CO3: ▢Describe ER model and normalization for database design
			CO4: Examine issues in data storage ▢and query processing and can formulate appropriate solutions .
			CO5: Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage
27	II/II	**FORMAL LANGUAGES AND AUTOMATA THEORY**	**CO1:** Classify machines by their power to recognize languages
			CO2: Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy
			CO3: Employ finite state machines to solve problems in computing
			CO4: Illustrate deterministic and non-deterministic machines
			CO5: Quote the hierarchy of problems arising in the computer science
28	II/II	**JAVA PROGRAMMING**	**CO1:** . Able to realize the concept of Object Oriented Programming & Java Programming Constructs
			CO2: Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords
			CO3: Apply the concept of exception handling and Input/

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			Output operations
			CO4: Able to design the applications of Java & Java applet
			CO5: Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit
29	**II/II**	**MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY**	**CO1**: The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
			CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
			CO3: . The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units .
			CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
			CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making
30	**II/II**	**DATABASE MANAGEMENT SYSTEMS LAB**	**CO1:** . Utilize SQL to execute queries for creating database and performing data manipulation operations.
			CO2: Examine integrity constraints to build efficient databases.
			CO3: . Apply Queries using Advanced Concepts of SQL
			CO4: Build PL/SQL programs including stored procedures, functions, cursors and triggers
31	**II/II**	**R PROGRAMMING LAB**	**CO1:** Access online resources for R and import new function packages into the R workspace
			CO2: Import, review, manipulate and summarize data-sets in R

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			CO3: Explore data-sets to create testable hypotheses and identify appropriate statistical tests.
			CO4: . Perform appropriate statistical tests using R
			CO5: Create and edit visualizations with R
32	II/II	**JAVA PROGRA MMING LAB**	**CO1** Evaluate default value of all primitive data type, Operations, Expressions, Control- flow, Strings
			CO2: Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
			CO3: Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
			CO4: Construct Threads, Event Handling, implement packages, developing applets
33	**II/II**	**WEB APPLICA TION DEVELOP MENT USING FULL STACK** Frontend Developme nt – Module -II	**CO1:** develop of the major Web application tier- Client side development
			CO2: participate in the active development of cross-browser applications through JavaScript
			CO3: Develop JavaScript applications that transition between states
34	**III/I**	**COMPUT ER NETWOR KS**	**CO1:** Demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards
			CO2: Discuss different transmission media and different

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			switching networks
			CO3. Analyze data link layer services, functions and protocols like HDLC and PPP
			CO4: Compare and Classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
			CO5: Determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.
35	III/I	**DESIGN AND ANALYSIS OF ALGORITHMS**	**CO1:** Analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
			CO2: List and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method
			CO3. Synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations
			CO4: Organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
			CO5: Demonstrate NP- Completeness theory ,lower bound theory and String Matching
36	III/I	**DATA WAREHOUSING AND DATA MINING**	**CO1:** Illustrate the importance of Data Warehousing, Data Mining and its functionalities and Design schema for real time data warehousing applications.
			CO2. Demonstrate on various Data Preprocessing Techniques viz. data cleaning, data integration, data transformation and data reduction and Process raw data to make it suitable for various data mining algorithms

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			CO3. Choose appropriate classification technique to perform classification, model building and evaluation.
			CO4 Make use of association rule mining techniques viz. Apriori and FP Growth algorithms and analyze on frequent itemsets generation.
			CO5. Identify and apply various clustering algorithm (with open source tools), interpret, evaluate and report the result.
37	III/I	**SOFTWARE PROJECT MANAGEMENT (Professional Elective –I)**	**CO1:** Apply the process to be followed in the software development life-cycle models
			CO2. Apply the concepts of project management & planning
			CO3. . Implement the project plans through managing people, communications and change
			CO4 .Conduct activities necessary to successfully complete and close the Software projects
			CO5. .Implement communication, modeling, and construction & deployment practices in software development

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38	III/I	EMPLOY ABILITY SKILLS-I	CO1: . Understand the corporate etiquette..
			CO2. Make presentations effectively with appropriate body language
			CO3. Be composed with positive attitude
			CO4 . Understand the core competencies to succeed in professional and personal life
39	III/I	DATA WAREHOUSING AND DATA MINING LAB	CO1: Design a data mart or data warehouse for any organization
			CO2. Extract knowledge using data mining techniques and enlist various algorithms used in information analysis of Data Mining Techniques
			CO3. . Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification for realistic data
			CO4 . . Implement and Analyze on knowledge flow application on data sets and Apply the suitable visualization techniques to output analytical results

			CO1 how reliable data communication is achieved through data link layer.
			CO2. Suggest appropriate routing algorithm for the network
			CO3:. Provide internet connection to the system and its installation

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40	III/I	COMPUTER NETWORKS LAB	CO4: . Work on various network management tools

41	III/I	CONTINUOUS INTEGRATION AND CONTINUOUS DELIVERY USING DevOps (Skill Oriented Course)	CO1:. Understand the why,What and how of devops adoption
			CO2 Attain literacy on Devops
			CO3:. Align Capabilities Required in the team
			CO4: Create an automated CICD Pipeline using a stack of tools.
42	III/II	MACHINE LEARNING	CO1:. Explain the fundamental usage of the concept Machine Learning system
			CO2: Demonstrate on various regression Technique
			CO3:. Analyze the Ensemble Learning Methods
			CO4: Illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
			CO5: Discuss the Neural Network Models and Fundamentals concepts of Deep Learning
43	III/II	COMPILE	CO1:. Demonstrate Phases in the design of compiler

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		R DESIGN	
			CO2: Organize Syntax Analysis, Top Down and LL(1) grammars.
			CO3: . Analyze synthesized, inherited attributes and syntax directed translation schemes
			CO4 Determine algorithms to generate code for a target machine
44	III/II	**CRYPTO GRAPHY AND NETWOR K SECURIT Y**	**CO1:**. Explain different security threats and countermeasures and foundation course of cryptography mathematics
			CO2. Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
			CO3 Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more
			CO4: Design applications of hash algorithms, digital signatures and key management techniques
			CO5: Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec .
45	III/II	**OBJECT ORIENTE D ANALYSI S AND DESIGN**	**CO1:**. Analyze and nature of Complex system and its solutions
			CO2: Illustrate & relate the conceptual model of the UML, identify & design the classes and relationships

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			CO3:. Analyze &Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications.
			CO4 Analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams.
			CO5 Analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.
46	III/II	**DATA COMMUNICATIONS**	**CO1** Know the Categories and functions of various Data communication Networks
			CO2: Design and analyze various error detection techniques..
			CO3:. . Demonstrate the mechanism of routing the data in network layer
			CO4 . Know the significance of various Flow control and Congestion control Mechanisms
47	III/II	**EMPLOYABILITY SKILLS-II**	**CO1:** Solve Various Basic Mathematics Problems by following different Methods
			CO2: Follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
			CO3:. Confidently solve any mathematical problems and utilize these mathematical skills both in their professional as well as personal life.
			CO4 : Analyze, summarize and present information in quantitative forms including table, graphs and formulas

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48	**III/II**	**MACHINE LEARNING USING PYTHON LAB**	**CO1:**. Implement Procedures for the Machine Learning algorithms
			CO2: Design and Develop Python programs for various Learning algorithms
			CO3:. Apply appropriate data sets to the Machine Learning algorithms
			CO4 : Develop Machine Learning algorithms to solve real world problems
49	**III/II**	**COMPILER DESIGN LAB**	**CO1** Design Simple Lexical Analyzers
			CO2: Determine predictive parsing table for a CFG
			CO3:. Apply Lex and Yacc tools.
			CO4 : Examine LR parser and generating SLR Parsing table.
			CO5: Relate Intermediate code generation for subset C language
50	**III/II**	**CRYPTOGRAPHY NETWORK SECURITY LAB**	**CO1:** Apply the knowledge of symmetric cryptography to implement encryption and decryption using Ceaser Cipher, Substitution Cipher, Hill Cipher
			CO2: . Demonstrate the different algorithms like DES, BlowFish, and Rijndael, encrypt the text "Hello world" using Blowfish

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			Algorithm.
			CO3:. . Analyze and implement public key algorithms like RSA, Diffie-Hellman Key Exchange mechanism, the message digest of a text using the SHA-1 algorithm
51	III/II	**MEAN STACK TECHNOLOGIES-MODULE I (HTML 5, JAVASCRIPT, EXPRESS.JS, NODE.JS AND TYPESCRIPT) (Skill Oriented Course)**	**CO1:**. .Develop professional web pages of an application using HTML elements like lists, navigations, tables, various form elements, embedded media which includes images, audio, video and CSS Styles
			CO2: . Utilize JavaScript for developing interactive HTML web pages and validate form data. .
			CO3. Build a basic web server using Node.js and also working with Node Package Manager (NPM).
			CO4 : . Build a web server using Express.js
			CO5: . Make use of Typescript to optimize JavaScript code by using the concept of strict type checking
52	IV/I	**CLOUD COMPUTING (Professional Elective-III)**	**CO1:**. Illustrate the key dimensions of the challenge of Cloud Computing
			CO2: Classify the Levels of Virtualization and mechanism of tools. .
			CO3. . Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
			CO4 : . Create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud

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			CO5: . Assess control storage systems and cloud security, the risks involved its impact and develop cloud application
53	IV/I	**COMPUTER VISION (Professional Elective-IV)**	**CO1:** . Identify basic concepts, terminology, theories, models and methods in the field of computer vision
			CO2: . Describe known principles of feature detection and matching,.
			CO3. Describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.
			CO4 : Suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths
54	IV/I	**UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY**	**CO1:** . . Development of a holistic perspective based on self-exploration about themselves (human being),family, society and nature/existence.
			CO2: . . Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
			CO3 Strengthening of self-reflection.
			CO4 : Development of commitment and courage to act.
55	IV/I	**INTERNET OF THINGS**	**CO1**. Understand internet of Things and its hardware and software components.

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			CO2: . Interface I/O devices, sensors & communication modules
			CO3. Remotely monitor data and control devices.
			CO4 : . Design real time IoT based applications
56	IV/I	**PRINCIPLES OF COMMUNICATIONS**	**CO1:** . . Analyze the performance of analog modulation schemes in time and frequency domains.
			CO2: . . Analyze the performance of angle modulated signals.
			CO3. Characterize analog signals in time domain as random processes and noise
			CO4 : Characterize the influence of channel on analog modulated signals
			CO5 : Determine the performance of analog communication systems in terms of SNR
			CO6 : Analyze pulse amplitude modulation, pulse position modulation, pulse code modulation and TDM systems.

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Artificial intelligence Course Outcomes

For theAcademicYear 2023-2024

S.No.	Year/Sem	Course Name	Course Outcomes
Artificial intelligence Course Outcomes for the Academic Year			
1	I/I	**Communicative English**	**CO1**: understand social or transactional dialogues spoken by native speakers of English and identifythe context, topic, and pieces of specific information
			CO2: ask and answer general questions on familiar topics and introduce oneself/others
			CO3: employ suitable strategies for skimming and scanning to get the general idea of a text and locatespecific information
			CO4: recognize paragraph structure and be able to match beginnings/endings/headings withparagraphs
			CO5: form sentences using proper grammatical structures and correct word forms
2	I/I	**Mathematics -I**	**CO1:** utilize mean value theorems to real life problems (L3)
			CO2: solve the differential equations related to various engineering fields (L3)
			CO3: familiarize with functions of several variables which is useful in optimization (L3)
			CO4: apply double integration techniques in evaluating areas bounded by region (L3)
			CO5: students will also learn important tools of calculus in higher dimensions. Students will becomefamiliar with 2- dimensional and 3-dimensional coordinate systems(L5)
3			**CO1:** Analyze the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.

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	I/I	**Applied Chemistry**	**CO2:** Utilize the theory of construction of electrodes, batteries and fuel cells in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.
			CO3: Synthesize nanomaterials for modern advances of engineering technology.
			CO4: Summarize the preparation of semiconductors; analyze the applications of liquid crystals and superconductors.
			CO5: Analyze the principles of different analytical instruments and their applications.
			CO6: Design models for energy by different natural sources.
			CO7: Obtain the knowledge of computational chemistry and molecular machines
4	I/I	**Programming for Problem Solving using C**	**CO:1** To write algorithms and to draw flowcharts for solving problems
			CO:2 To convert flowcharts/algorithms to C Programs, compile and debug programs
			CO:3 To use different operators, data types and write programs that use two-way/ multi-way selection
			CO:4 To select the best loop construct for a given problem
			CO:5 To design and implement programs to analyze the different pointer applications

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			CO:6 To decompose a problem into functions and to develop modular reusable code
			CO:7 To apply File I/O operations
5	I/I	**Computer Engineering Workshop**	**CO1:** Assemble and disassemble components of a PC
			CO2: Construct a fully functional virtual machine, Summarize various Linux operating system Commands
			CO3: Recognize characters & extract text from scanned images, Create audio files and podcasts.
6	I/I	**English Communication Skills Laboratory**	**CO1:** Better pronunciation and accent
			CO2: Ability to use functional English
			CO3: Competency in analytical skills and problem solving skills
7	I/I	**Applied Chemistry Lab**	**CO1:** Student will know structure property relationship and corrosion.
			CO2: Student will know the use of water as an engineering material, its properties and applications.
			CO3: Student will generate usefulness and apply the various instrumental techniques for identification and characterization of materials
			CO4: Student will understand the various types of fuels and combustion.
			CO5: Student will know the types, properties and applications of polymers and nanomaterials.
8	I/I	**Programming for Problem Solving using C Lab**	**CO1:** Gains Knowledge on various concepts of a C language.
			CO2: Able to draw flowcharts and write algorithms.
			CO3: Able design and development of C problem solving skills.
			CO4: Able to design and develop modular programming skills.
			CO5: Able to trace and debug a program

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9	I/II	**Mathematics – II**	**CO1:** develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)
			CO2: solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
			CO3: evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
			CO4: apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
			CO5: apply numerical integral techniques to different Engineering problems (L3)
			CO6: apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)
10	I/II	**Digital Logic Design**	**CO1:** An ability to define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation .
			CO2 An ability to understand the different switching algebra theorems and apply them for logic functions

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			CO3 An ability to define the Karnaugh map for a few variables and perform an algorithmic reduction of logic functions
			CO4 Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays .
			CO5: Students will be able to design various sequential circuits starting from flip-flop to registers and counters.
11	I/II	**Python Programming**	**CO1:** Develop essential programming skills in computer programming concepts like data types, containers
			CO2: Apply the basics of programming in the Python language
			CO3: Solve coding tasks related conditional execution, loops
			CO4: Solve coding tasks related to the fundamental notions and techniques used in objectoriented programming
			CO1: Summarize the properties, interfaces, and behaviors of basic abstract data types
			CO2: Discuss the computational efficiency of the principal algorithms for sorting &

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12	I/II	Data Structures	searching
			CO3: Use arrays, records, linked structures, stacks, queues, trees, and Graphs in writingprograms
			CO4: Demonstrate different methods for traversing trees
13	I/II	**Applied Physics**	**CO:1**Explain the need of coherent sources and the conditions for sustained interference (L2). Identifythe applications of interference in engineering (L3). Analyze the differences betweeninterference and diffraction with applications (L4). Illustrate the concept of polarization of lightand its applications (L2). Classify ordinary refracted light and extraordinary refracted rays by their states of polarization (L2) .
			CO:2 Explain various types of emission of radiation (L2). Identify the role of laser in engineeringapplications (L3). Describe the construction and working principles of various types of lasers (L1). Explain the working principle of optical fibers (L2). Classify optical fibers based onrefractive index profile and mode of propagation (L2). Identify the applications of optical fibersin medical, communication and other fields (L2). Apply the fiber optic concepts in variousfields (L3).
			CO:3 Describe the dual nature of matter (L1). Explain the significance of wave function (L2). Identifythe role of Schrodinger's time independent wave equation in studying particle in onedimensional infinite potential well (L3). Identify the role of classical and quantum free electrontheory in the study of electrical conductivity (L3).

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Classify the energy Bands of solids (L2)

			CO:4 Explain the concept of dielectric constant and polarization in dielectric materials (L2). Summarize various types of polarization of dielectrics (L2). Interpret Lorentz field andClaussius-Mosotti relation in dielectrics (L2). Classify the magnetic materials based onsusceptibility and their temperature dependence (L2). Explain the applications of dielectric andmagnetic materials (L2). Apply the concept of magnetism to magnetic devices (L3)
			CO:5 Outline the properties of charge carriers in semiconductors (L2). Identify the type ofsemiconductor using Hall effect (L2). Identify applications of semiconductors in electronicdevices (L2). Classify superconductors based on Meissner's effect (L2). Explain Meissner'seffect, BCS theory & Josephson effect in superconductors (L2).
14	I/II	**Python Programming Lab**	**CO1:** Develop essential programming skills in computer programming concepts like data types, containers
			CO2: Apply the basics of programming in the Python language
			CO3: Solve coding tasks related conditional execution, loops
			CO4: Solve coding tasks related to the fundamental notions and techniques used in objectoriented programming
15	I/II	**Data Structures Lab**	**CO1:** Use basic data structures such as arrays and linked list.
			CO2: Programs to demonstrate fundamental algorithmic problems including Tree. Traversals, Graph traversals, and shortest paths.
			CO3: Use various searching and sorting algorithms.

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S.NO.	YEAR/SEM	COURSE NAME	Course Outcomes
16	I/II	Applied Physics Lab	
17	I/II	Applied Physics Lab	**CO1:** Demonstrate the concepts of physics experimentally with physical equipment.
			CO2: Summarize the required data to perform experiments related to engineering physics.
			CO3: Calculate the physical values with targeted accuracy by explaining the basic knowledge, principles, and concepts of physics using required instruments.
18	I/II	**CONSTITUTION OF INDIA**	CO1:Understand historical background of the constitution making and its importance for building a democratic India.
			CO2: Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
			C03: Understand the value of the fundamental rights and duties for becoming good citizen of India.
			CO4: Analyze the decentralization of power between central, state and local self-government.
			CO5:Apply the knowledge in strengthening of the constitutional institutions like CAG, Election

S.NO.	YEAR/SEM	COURSE NAME	Course Outcomes

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19	II/I	**Database Management Systems**	**CO1:** Describe a relational database and object-oriented database
			CO2:. Create, maintain and manipulate a relational database using SQL
			CO3:. Describe ER model and normalization for database design
			CO4: Examine issues in data storage and query processing and can formulate appropriate solutions
			CO5: Outline the role and issues in management of data such as efficiency, privacy, security, ethical responsibility, and strategic advantage
20	II/I	**Object Oriented Programming with Java**	**CO1** Able to realize the concept of Object Oriented Programming & Java Programming Constructs
			CO2: Able to describe the basic concepts of Java such as operators, classes, objects, inheritance, packages, Enumeration and various keywords

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			CO3:. Apply the concept of exception handling and Input/ Output operations
			CO4: . Able to design the applications of Java & Java applet
			CO5: Able to Analyze & Design the concept of Event Handling and Abstract Window Toolkit
21	**II/I**	**Introduction to Artificial Intelligence and Machine Learning**	**CO1:** Enumerate the history and foundations of Artificial Intelligence
			CO2: Apply the basic principles of AI in problem solving
			CO3: Choose the appropriate representation of Knowledge
			CO4: Enumerate the Perspectives and Issues in Machine Learning

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CO5: Identify issues in Decision Tree Learning

22	**II/I**	**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**	**CO1:** Comprehend mathematical principles and logic
			CO2: Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
			CO3:. Manipulate and analyze data numerically and/or graphically using appropriate Software
23	**II/I**	**MATHEMATICS - III**	**CO1:** Interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
			CO2: Estimate the work done against a field, circulation and flux using vector calculus (L5)
			CO3: Apply the Laplace transform for solving differential equations (L3)
			CO4: Find or compute the Fourier series of periodic signals (L3)
			CO5: Know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
			CO6: . Identify solution methods for partial differential equations that model physical processes (L3)
24	**II/I**	**Introduction to Artificial Intelligenc**	**Co1:** Apply the basic principles of AI in problem solving using LISP/PROLOG

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		e and Machine Learning Lab	**CO2**: Implement different algorithms using LISP/PROLOG
			CO3: Develop an Expert System using JESS/PROLOG
25	**II/I**	**Object Oriented Programming with Java Lab**	**CO1:** Evaluate default value of all primitive data type, Operations, Expressions, Control-flow, Strings
			CO2: Determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
			CO3: Illustrating simple inheritance, multi-level inheritance, Exception handling mechanism
			CO4: Construct Threads, Event Handling, implement packages, developing applets
26		**Database**	**CO1:**

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	II/I	**Management Systems Lab**	Utilize SQL to execute queries for creating database and performing data manipulation operations
			CO2: Examine integrity constraints to build efficient databases
			CO3 Apply Queries using Advanced Concepts of SQL
			CO4 Build PL/SQL programs including stored procedures, functions, cursors and triggers .
27	**II/I**	**Mobile App Development**	**CO1:**Identify various concepts of mobile programming that make it unique from programming for other platforms
			CO2:.Critique mobile applications on their design pros and cons
			CO3: Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
			CO4: Program mobile applications for the Android operating system that use basic and advanced phone features and
			CO5: Deploy applications to the Android marketplace for distribution.
28	**II/I**	**Essence of Indian Traditional Knowledge**	**CO1** Understand the significance of Indian Traditional Knowledge
			CO2: Classify the Indian Traditional Knowledge

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			CO3: Compare Modern Science with Indian Traditional Knowledge system.
			CO4. Analyze the role of Government in protecting the Traditional Knowledge
			CO5. Understand the impact of Philosophical tradition on Indian Knowledge System
29	II/II	**PROBABILITY AND STATISTICS**	**CO1:** Classify the concepts of data science and its importance (L4) or (L2)
			CO2 Interpret the association of characteristics and through correlation and regression tools (L4)
			CO3 Make use of the concepts of probability and their applications (L3)
			CO4: Apply discrete and continuous probability distributions (L3) and event handling
			CO5: Design the components of a classical hypothesis test (L6)
			CO6: Infer the statistical inferential methods based on small and large sampling tests (L4)
30	II/II	**FORMAL LANGUAGES AND AUTOMA**	**CO1:**Classify machines by their power to recognize languages
			CO2: Summarize language classes & grammars relationship among them with the help of Chomsky hierarchy

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		TA THEORY	**CO3:** Employ finite state machines to solve problems in computing
			CO4: Illustrate deterministic and non-deterministic machines
			CO5: Quote the hierarchy of problems arising in the computer science
31	**II/II**	**MANAGERIAL ECONOMICS AND FINANCIAL ACCOUNTANCY**	**CO1**: The Learner is equipped with the knowledge of estimating the Demand and demand elasticities for a product
			CO2: The knowledge of understanding of the Input-Output-Cost relationships and estimation of the least cost combination of inputs
			CO3: . The pupil is also ready to understand the nature of different markets and Price Output determination under various market conditions and also to have the knowledge of different Business Units .
			CO4: The Learner is able to prepare Financial Statements and the usage of various Accounting tools for Analysis
			CO5: The Learner can able to evaluate various investment project proposals with the help of capital budgeting techniques for decision making
32	**II/II**	**Computer Organization**	**CO1:** Develop a detailed understanding of computer systems
			CO2 Cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
			CO3: . Develop a detailed understanding of architecture and

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			functionality of central processing unit
			CO4 Exemplify in a better way the I/O and memory organization
			CO5 Illustrate concepts of parallel processing, pipelining and inter processor communication
33	**II/II**	**R PROGRAMMING LAB**	**CO1:** Access online resources for R and import new function packages into the R workspace
			CO2: Import, review, manipulate and summarize data-sets in R
			CO3: Explore data-sets to create testable hypotheses and identify appropriate statistical tests.
			CO4: . Perform appropriate statistical tests using R
			CO5: Create and edit visualizations with R
34	**II/II**	**Data Warehousing and Mining**	**CO1** Summarize the architecture of data warehouse
			CO2 Apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data.
			CO3: Construct a decision tree and resolve the problem of model overfitting
			CO4:

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			Compare Apriori and FP-growth association rule mining algorithms for frequent itemset generation	
			CO5: Apply suitable clustering algorithm for the given data set	
35	II/II	**Data Mining using Python Lab**	**CO1:** Apply preprocessing techniques on real world datasets	
			CO2: Apply apriori algorithm to generate frequent itemsets.	
			CO3 Apply Classification and clustering algorithms on different datasets.	
36	II/II	**Web Application Development Lab**	**CO1:** Develop Single Page Applications	
			CO2: Develop NodeJS&ReactJS Reusable Service	
			CO3. Store the data in MySQL	
			CO4: Get acquainted with the latest web application development trends in the IT industry	

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37	II/II	Natural Language Processing with Python	CO1: Email: info@newton.edu.in Explore natural language processing (NLP) libraries in Python
			CO2: Learn various techniques for implementing NLP including parsing & text processing
			CO3. Understand how to use NLP for text feature engineering

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING 2023-2024R20 & R23

DEPARTMENT OF ELECTRONIC AND COMMUNICATION ENGINEERING I&II Sem Course Outcomes for the Academic Year			
S.No.	**Year/Sem**	**Course Name**	**Course Outcomes**
1	I/I	**M1(Linear algebra and calculus)**	**CO1:** Develop and use of matrix algebra techniques that are needed by engineers for practical applications.
			CO2: Utilize mean value theorems to real life problems.
			CO3: Familiarize with functions of several variables which is useful in optimization.
2	I/I	**C programming**	**CO1:** Understand basics of computers, the concept of algorithm and algorithmic thinking.
			CO2: Analyse a problem and develop an algorithm to solve it. .
			CO3: Implement various algorithms using the C programming language.
			CO4: Understand more advanced features of C language.
			CO5: Develop problem-solving skills and the ability to debug and optimize the code.
3	I/I	**Engineering Physics**	**CO1** Analyze the intensity variation of light due to polarization, interference and diffraction..
			CO2: Familiarize with the basics of crystals and their structures
			CO3: Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.
			CO4: Summarize various types of polarization of dielectrics and classify the magnetic materials.
			CO5: Explain the basic concepts of Quantum Mechanics and the band theory of solids.
4	I/I	**Basic Electric and Electronic and Engineering**	**CO1:** Describe fundamental laws, operating principles of motors/generators, MC/MI instruments (L2)
			CO2: Demonstrate the working of electrical machines, measuring instruments

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			and power generation stations. (L2)
			CO3 Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits and machines. (L3)
			CO4: Calculate electrical load and electricity bill of residential and commercial buildings. (L4).
5	I/I	**Engineering Drawing**	**CO1:** Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
			CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views
			CO3: Understand and draw projection of solids in various positions in first quadrant
			CO4: Explain principles behind development of surfaces.
			CO5: Prepare isometric and perspective sections of simple solids.
6	I/I	**IT Workshops**	**CO1:** Perform Hardware troubleshooting. CO2: Understand Hardware components and inter dependencies. CO3: Safeguard computer systems from viruses/worms. CO4: Document/ Presentation preparation. CO5: Perform calculations using spreadsheets.
			CO2: Understand Hardware components and inter dependencies.
			CO3: Safeguard computer systems from viruses/worms
			CO4: Document/ Presentation preparation.
			CO5: Perform calculations using spreadsheets
7	I/I	**C Programming Lab**	**CO1:** Understand basics of computers, the concept of algorithm and algorithmic thinking.
			CO2: Analyse a problem and develop an algorithm to solve it
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8	I/I	**Engineering Physics Lab**	**CO1:** Operate optical instruments like travelling microscope and spectrometer.
			CO2: Estimate the wavelengths of different colours using diffraction grating
			CO3: Plot the intensity of the magnetic field of circular coil carrying current with distance
			CO4: Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
			CO5: Calculate the band gap of a given semiconductor
			CO6: Identify the type of semiconductor using Hall effect.
9	I/I	**Electrical & Electronics Engineering Workshop**	**CO1:** Measure voltage, current and power in an electrical circuit. (L3)
10	I/II	**Chemistry**	**CO1:** Demonstrate the corrosion prevention methods and factors affecting corrosion.
			CO2: Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers
			CO3: Explain calorific values, octane number, refining of petroleum and cracking of oils.
			CO4: Explain the setting and hardening of cement
			CO5: Summarize the concepts of colloids, micelle and nanomaterials.
11	I/II	**Networks Analysis**	**CO1:** Understand basic electrical circuits with nodal and mesh analysis. CO2: Analyse the circuit using network simplification theorems. CO3: Find Transient response and Steady state response of a network. CO4: Analyse electrical networks in the Laplace domain. CO5: Compute the parameters of a two-port network
			CO2: Analyse the circuit using network simplification theorems.
			CO3: Find Transient response and Steady state response of a network.
			CO4: Analyse electrical networks in the Laplace domain.
			CO5: Compute the parameters of a two-port network

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12	I/II	**M-2(differential equations & vector calculus)**	**CO1:** Solve the differential equations related to various engineering fields. CO2: Identify solution methods for partial differential equations that model physical processes. CO3: Interpret the physical meaning of different operators such as gradient, curl and divergence. CO4: Estimate the work done against a field, circulation and flux using vector calculus.
			CO2: Identify solution methods for partial differential equations that model physical processes
			CO3: Interpret the physical meaning of different operators such as gradient, curl and divergence.
			CO4: Estimate the work done against a field, circulation and flux using vector calculus
13	I/II	**Communicative English**	**CO1:** CO1: Understand the context, topic, and pieces of specific information from social or Transactional dialogues.
			CO2: Apply grammatical structures to formulate sentences and correct word forms.
			CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions.
			CO4: Evaluate reading / listening texts and to write summaries based on global comprehension of these texts
			CO5: Create a coherent paragraph, essay, and resume.
14	I/II	**Basic Concepts of Civil & Mechanical Engineering**	**CO1:** Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.
			CO2: Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.
			CO3: Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation.
			CO4: Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.
15	I/II	**English Lab**	**CO1:** Understand the different aspects of the English language proficiency with emphasis on LSRW skills.

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			CO2: Apply communication skills through various language learning activities.
			CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension
			CO4: Evaluate and exhibit professionalism in participating in debates and group discussions
16	I/II	Networks Analysis	**CO1**: Verify Kirchoff's laws and network theorems.
			CO2: Measure time constants of RL & RC circuits.
			CO3: Analyze behavior of RLC circuit for different cases.
17	I/II	Engineering workshop	**CO1**: Identify workshop tools and their operational capabilities.
			CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
			C03: Apply fitting operations in various applications.
			CO4: Apply basic electrical engineering knowledge for House Wiring Practice structural patterns.
18	I/II	Chemistry Lab	**CO1:** Determine the cell constant and conductance of solutions.
			CO2: Prepare advanced polymer Bakelite materials.
			CO3: Measure the strength of an acid present in secondary batteries.
			CO4: Analysis the IR spectra of some organic compounds.
19	II/I	Electronic devices and circuits	**CO1:** Apply the basic concepts of semiconductor physics.
			CO2: owtheconstruction,workingprincipleofrectifierswithandwithoutfilt erswi threlevant expressions andnecessarycomparisons.

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			CO3: Understand the formation of p-n junction and how it can be used as a p n junction as diode in different modes of operation.
			CO4: Understand the construction, principle of operation of transistors, BJT and FET with the ir V-I characteristics in different configurations
			CO5: Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.
20	II/I	**Switching theory and logic design**	**CO1:** Classify different number systems and apply to generate var ious codes
			CO2: Use the concept of Boolean algebra in minimization of switching functions
			CO3: Design different types of combinationa llogic circuits
			CO4: Apply knowledge of flip-flops in designing of Registers and counters
			CO5: The operation and design methodology for synchronous sequential circuits and algorithmic statemachines.
21	II/I	**Signals and systems**	**CO1:** Differentiate the various classifications of signals and systems
			CO2: Analyze the frequency domain representation of signals using Fourier

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			CO3 Classify the systems based on their properties and determine the response ofLTI Systems.
			CO4: Know the sampling process and various types of sampling techniques.
			CO5: Apply Laplace and z-transforms to analyze signals and Systems (continuous&discrete).
22	II/I	**Random variable and stocastic process**	**CO1:** Mathematically modelther and omphenomena and solve simple probabilistic problems.
			CO2: Identify different types of random variables and compute statistical averages of the
			CO3: Characterize the random processes in the time and frequency domains.
			CO4: Analyze the LTI systems with random inputs.
23	II/I	**MATHEMATICS-III**	familiarize with Laplace Transform, Fourier Transform, their application, logic group, sets, lattices, Boolean algebra and Karnaugh maps.
		OOPS THROUGH JAVA Lab	**CO1:** Identify classes, objects, members of a class and the relationship Among the mneeded for aspecific problem

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			CO2: Implementprogramstodistinguishdifferentformsofinheritance
			CO3: Create package and toreusethem K3
			CO4: DevelopprogramsusingExceptionHandlingmechanism
24	II/I		**Co:5:** Developmultithreaded applicationusingsynchronizationconcept.
			Co6: DesignGUIbased applicationsusingSwings andAWT.
25	II/I	**Elecronics device and circuits lab**	**CO1:**I:Learn the characteristics of basic electronic devices
			CO2::::Learn the Characteristics of UJT
			CO3:Learn the Characteristics of FET
			CO4::::Learn about Power amplifiers.
			CO5: Learn about Differential amplifiers
26	II/I	**Switching theory and logic desin lab**	**CO1:**Create dynamic and interactive web pages using HTML, CSS & Java Script
			CO2: Experiment with Learn and implement XML concepts
			CO3: Develop web applications using PHP
			CO4: Show the Install Tomcat Server and execute client-server programs
		Python lab	CO1: Know comprehensions, generators in python

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			CO2: Know exception handling inpython
			CO3: Know file I/O
			CO4: Understand various data types like lists, tuples, strings etc
			CO5: Know the usage of various pre-defined functions on the above data types
27	II/II	**Electronic circuit analysis**	CO1::EDesign and analysis ofsmall signal high frequency transistor amplifier using BJT and FET
			CO2: Design and analysis of multistage amplifiers using BJT and FET and Differential amplifier using BJT.
			CO3: Derive the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concep
			CO4: Know the classification of the power and tuned amplifiers and their analysis with performance comparison

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| 29 | II/II | Digital ic design | **CO1:** Understand the structure of commercially available digital |

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			integrated circuit families
			CO2: Learn the IEEE Standard 1076 Hardware Description Language (VHDL).
			CO3: Model complex digital systems at several levels of abstractions, behavioral, structural, and rapid system prototyping.
			CO4: Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL
	II/II	**Analog communications**	**CO1:**Differentiate various Analog modulation and demodulation schemes and their spectral characteristics
			CO2: Analyze noise characteristics of various analog modulation methods
			CO4: Design simple analog systems for various modulation techniques
	II/II	**Linear control system**	**CO1:**This course introduces the concepts of feedback and its advantages to various control systems
			CO2:Control systems for various applications can be designed using time-domain and frequency domain analysis
	II/II	**Management and organizational behavior**	CO1:After completion of the Course the student will acquire the knowledge on management functions, global leadership and

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			organizational structure.
			CO2: Will familiarize with the concepts of functional management that is HR Mand Marketing of new product developments.
			Co3: The learnerisable to think in strategically through contemporary management practices.
			Co4: The learner can develop positive attitude through personality development and can equip with motivational theories.
			Co5: The student can attain the group performance and grievance handling in managing the organizational culture
	II/II	**Electronic Circuit Analysis Lab**	CO1: Design different types of Amplifier and Oscillator circuits(K6)
			CO2: Simulate different types of Amplifier and Oscillator circuits using software tool
			CO3: Test different types of Amplifiers and Oscillator circuits using hardware. (K4)
	II/II	Analog Communication Lab	CO1: Demonstrate analog modulation techniques.
			CO2: Construct various receiver circuits.
			CO3: Measure and analyze receiver characteristics.
	II/II	Digital IC Design Lab	CO1 :Understand the pin configuration of various digital ICs used in the lab CO2 Conduct the experiment and verify the properties of various logic circuits. CO3 Analyze the

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			sequential and combinational circuits. CO4 Design of any sequential/combinational circuit using Hardware
			CO2 :Conduct the experiment and verify the properties of various logic circuits
			CO3: Analyze the sequential and combinational circuits.
			CO4: Design of any sequential/combinational circuit using Hardware
	II/II	Soft Skills	CO1: Use language fluently, accurately and appropriately indebates and group discussions
			CO2 :Use their skills of listening comprehension to communicate effectively incross-cultural contexts.
			CO3: Learn and use new vocabulary.
			CO 4 :Write resumes, project reports and reviews.
			CO5 : Exhibit interview skills and develop soft skills.
	III/I	Analog IC's and Applications	CO1: Describe the Op-Amp and internal Circuitry: 555 Timer, PLL
			CO2:Discuss the Applications of Operational amplifier: 555 Timer, PLL
			CO3:Design the Active filters using Operational Amplifier

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			CO4:Use the Op-Amp in A to D & D to A Converters
	III/I	Electromagnetic waves and transmision lines	Determine E and H using various laws and applications of electric & magnetic fields
			Apply the Maxwell equations to analyze the time varying behavior of EM waves
			Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media
			Calculate Brewster angle, critical angle and total internal reflection
			Derive and Calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith chart
	III/I	Digital Cammunication	CO1:Analyze the performance of a Digital Communication System for probability of error and are able to design a digital communication system.
			CO2: Analyze various source coding techniques.
			CO3:Compute and analyze Block codes, cyclic codes and convolution codes.
			CO4:Design a coded communication system.

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			CO5:Analyze various source coding techniques.
	III/I	Antenna and wave propagation	CO1: Identify basic antenna parameters.
			CO2: Design and analyze wire antennas, loop antennas, reflector antennas, lens antennas, horn antennas and micro-strip antennas
			CO3: Quantify the fields radiated by various types of antennas
			CO4: Design and analyze antenna arrays
			CO5: Analyze antenna measurements to assess antenna's performance
	III/I	Electronic measurements and Instrumentation	CO1: Select the instrument to be used based on the requirements.
			CO2: Understand and analyze different signal generators and analyzers.
			CO3:Understand the design of oscilloscopes for different applications.
			CO4:Design different transducers for measurement of different parameters.

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	III/I	Analog ICs and Application Lab	CO1: Students can understand the architecture of modern computer.
			CO2:They can analyze the Performance of a computer using performance equation
			CO3: Understanding of different instruction types.
			CO4 :Students can calculate the effective address of an operand by addressing modes
			CO5: They can understand how computer stores positive and negative numbers.
			CO6: Understand the concepts of I/O Organization and Memory systems oscillators and multivibrator circuits using op-amp CO5: Design and analyse the variouimers application of 555 t.
			CO7 : Analyse the performance of oscillators and multivibrators using PSPICE
	III/I	Digital communication Lab	CO1:Able to understand basic theories of Digital communication system in practical.
			CO2:Able to design and implement different modulation and demodulation techniques
			CO3:Able to analyze digital modulation techniques by using MATLAB tools

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			CO4: Able to identify and describe different techniques in modern digital communications, in particular in source coding using MAT lab tools.
			CO5:Able to perform channel coding.
	III/I	Data Structure Using Java Lab	**CO1**: Be able to design and analyze the time and space efficiency of the data structure ·
			CO2: Be capable to identity the appropriate data structure for given problem ·
			CO3: Have practical knowledge on the applications of data structures
	III/II	Micro processor and Micro controller	**CO1:** . Understand the architecture of microprocessor/ microcontroller and their operation.
			CO2: Demonstrate programming skills in assembly language for processors and Controllers.
			CO3: Analyze various interfacing techniques and apply them for the design of processor / Controller based systems
	III/II	VLSI Design	**CO1:** Demonstrate a clear understanding of CMOS fabrication flow and technology scaling. .
			CO2: Apply the design Rules and draw layout of a given logic circuit.
			CO3: Design basic building blocks in Analog IC design
			CO4: Analyze the behavior of amplifier circuits with various loads.
	III/II	Digital Signal Processing	**CO1:** Apply the difference equations concept in the analysis of Discrete time systems

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			CO2: Use the FFT algorithm for solving the DFT of a given signal
			CO3: Design a Digital filter (FIR&IIR) from the given specifications
			CO4: Realize the FIR and IIR structures from the designed digital filter

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	III/II	Embeded Systems	**CO1:** Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
			CO2: . The hardware components required for an embedded system and the design approach of an embedded hardware
			CO3: The various embedded firmware design approaches on embedded environment
			CO4: Understand how to integrate hardware and firmware of an embedded system using real time operating system
	III/II	Computer Network	**CO1:** Explain basic concepts, OSI reference model, services and role of each layer of OSI model and TCP/IP, networks devices and transmission media, Analog and digital data transmission K1,K2
			CO2: Apply channel allocation, framing, error and flow control techniques. K3
			CO3: Describe the functions of Network Layer i.e. Logical addressing, subnetting & Routing Mechanism. K2,K3
			CO4: Explain the different Transport Layer function i.e. Port addressing, Connection Management, Error control and Flow control mechanism
	III/II	Micro processor and Micro controller Lab	**CO1:** Assess and solve basic binary math operations using the microprocessor and explain the microprocessor's and Microcontroller's internal architecture and its operation within the area of manufacturing and performance

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			CO2: Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer
			CO3: Compare accepted standards and guidelines to select appropriate Microprocessor (8085 & 8086) and Microcontroller to meet specified performance requirements.
			CO4: Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor and microcontroller.
	III/II	**VLSI Design Lab**	**CO1:** Demonstrate a clear Understanding in hardware design language Verilog HDL
			CO2: Model a Combinational circuit using hardware description language Verilog HDL and validate its functionality
			CO3: Design and implement a sub system on a FPGA board..
			CO4: Model a Sequential circuit using hardware description language Verilog HDL and validate its functionality
	III/II	Digital Signal processing Lab	**CO1** Experiment concepts of DSPand its applications usingMATLABSoftware

			CO2 To understand about the basic signal generation
			CO3 To learn Fourier Transform Concepts

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			CO4 To design FIR filters
	IV/I	**Optical Communications**	**CO1** Choose necessary components required in modern optical communications systems .
			CO2 . Design and build optical fiber experiments in the laboratory, and learn how to calculate electromagnetic modes in waveguides, the amount of light lost going through an optical system, dispersion of optical fibers
			CO3 Use different types of photo detectors and optical test equipment to analyze optical fiber and light wave systems
			CO4 Choose the optical cables for better communication with minimum losses
	IV/I	**Satellite Communications**	1. Understand the concepts, applications and subsystems of Satellite communications.

			2. Derive the expression for G/T ratio and to solve some analytical problems on satellite link design.
			3. Understand the various types of multiple access techniques and architecture of earth station design
			4. Understand the concepts of GPS and its architecture.
	IV/I	**Radar Engineering**	1. Derive the radar range equation and to solve some analytical problems.

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			2. Understand the different types of radars and its applications.
			3. Understand the concept of tracking and different tracking techniques.
			4. Understand the various components of radar receiver and its performance.
	IV/I	**Image Processing**	1. Perform image manipulations and different digital image processing techniques 2. Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image. 3. Analyze pseudo and full color image processing techniques. 4. Apply various morphological operators on images

			2. Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.
			3. Analyze pseudo and full color image processing techniques.
			4. Apply various morphological operators on images
	IV/I	**Concepts of Power System Engineering**	CO1 Learn to manipulate matrices and to do matrix algebra, determinants, Eigen values Eigen vectors and to solve the system of linear equations.

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			CO2 Learn to analyze and solve the fundamental problems with prescribed or free boundary conditions in simple cases
			. CO3 Learn to understand how signals, systems, inference combine in prototypical tasks of communication, control and signal processing.
			CO4 Apply concepts of Probability to solve problems in Electronic Engineering

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ELECTRICAL & ELECTRONICS ENGINEERING
I & II Sem Course Outcomes

S.No.	Year/Sem	Course Name	Course Outcomes
		ELECTRICAL &ELECTRONICS ENGINEERING	
		I&II Sem Course Outcomes for the Academic Year 2023-2024	
1	I/I	**ENGLISH COMMUNICATIVE ENGLISH**	**CO1**: Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
			CO2: Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
			CO3: Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
			CO4: Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
			CO5: Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing
2	I/I	**MATHEMATICS-I**	**CO1:** utilize mean value theorems to real life problems (L3)
			CO2: solve the differential equations related to various engineering fields (L3)
			CO: 3familiarize with functions of several variables which is useful in optimization (L3)
			CO: 4 Apply double integration techniques in evaluating areas bounded by region (L3)
			CO:5 students will also learn important tools of calculus in higher dimensions. Students will become familiar with 2- dimensional and 3-dimensional coordinate systems (L5)
3	I/I	**MATHEMATICS-II**	**CO:1** develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)

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			CO:2 solve system of linear algebraic equations using Gauss elimination, Gauss Jordan, Gauss Seidel (L3)
			CO:3 evaluate the approximate roots of polynomial and transcendental equations by different algorithms (L5)
			CO:4 apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
			CO:5 apply numerical integral techniques to different Engineering problems (L3)
4	I/I	PROGRAMMING FOR PROBLEM SOLVING USING C	**CO:1** To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
			CO:2 To gain knowledge of the operators, selection, control statements and repetition in C
			CO:3 To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
			CO:4 To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
			CO:5 To assimilate about File I/O and significance of functions
5	I/I	ENGINEERING DRAWING & DESIGN	**CO1:** To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.
			CO2: Constructing regular polygons by general methods, inscribing and describing polygons on circles. .
			CO3: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangents & normals for the curves
			CO4: Plain scales, diagonal scales and vernier scales
			CO5: The objective is to represent the object in 3D view through isometric views.
6	I/I	ENGLISH COMMUNICATION SKILLS LABORATORY	CO1: Vowels, Consonants, Pronunciation, Phonetic Transcription
			CO2: Past tense markers, word stress-di-syllabic words, Poly-Syllabic words

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			CO3:Rhythm & Intonation
			CO4:Contrastive Stress (Homographs)
			CO5:Word Stress: Weak and Strong forms Stress in compound words
7	I/I	**ELECTRICAL ENGINEERING WORKSHOP**	CO1:To demonstrate the usage of measuring equipment
			CO2: To train the students in setting up simple wiring circuits
			CO3: To impart methods in electrical machine wiring
8	I/I	**PROGRAMMING FOR PROBLEM SOLVING USING C LAB**	CO:1Apply the principles of C language in problem solving
			CO:2 To design flowcharts, algorithms and knowing how to debug programs.
			CO:3 To design & develop of C programs using arrays, strings pointers & functions.
			CO:4 To review the file operations, preprocessor commands.
9	I/I	**ENVIRONMENTAL SCIENCE**	CO:1 Overall understanding of the natural resources.
			CO:2 Basic understanding of the ecosystem and its diversity.
			CO:3 Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
			CO:4 An understanding of the environmental impact of developmental activities.
			CO:5 Awareness on the social issues, environmental legislation and global treaties.
10	I/II	**MATHEMATICS-III**	CO:1 interpret the physical meaning of different operators such as gradient, curl and divergence (L5)

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			CO:2 estimate the work done against a field, circulation and flux using vector calculus (L5)
			CO:3 apply the Laplace transform for solving differential equations (L3)
			CO:4 find or compute the Fourier series of periodic signals (L3)
			CO:5 know and be able to apply integral expressions for the forwards and inverse Fourier transform to a range of non-periodic waveforms (L3)
11	I/II	**APPLIED PHYSICS**	CO1 **Explain** the need of coherent sources and the conditions for sustained interference (L2)
			CO:2 **Identify** engineering applications of interference (L3
			CO:3 **Analyze** the differences between interference and diffraction with applications (L4)
			CO:4 **Illustrate** the concept of polarization of light and its applications (L2)
			CO:5 **Classify** ordinary polarized light and extraordinary polarized light (L2)
12	I/II	**DATA STRUCTURES THROUGH C**	CO:1 Operations on linear data structures and their applications
			CO:2 The various operations on linked lists
			CO:3 The basic concepts of Trees, Traversal methods and operations.
			CO:4 Concepts of implementing graphs and its relevant algorithms
			CO:5 Sorting and searching algorithms
13	I/II	**ELECTRICAL CIRCUIT ANALYSIS - I**	CO:1 To study the concepts of passive elements, types of sources and various network reduction techniques.
			CO:2 To understand the applications of network topology to electrical circuits.
			CO:3 To study the concept of magnetic coupled circuit.
			CO:4 Get the knowledge on different hydraulic machinery devices and its principles that will be utilized in hydropower development and for other practical usages
			CO:5 To understand the behavior of RLC networks for sinusoidal excitations

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14	I/II	**BASIC CIVIL AND MECHANICAL ENGINEERING**	CO:1 To impart basic principles of stress, strain, shear force and bending moment
			CO:2 To teach principles of strain measurement using electrical strain gauges.
			CO:3 To impart basic characteristics of building materials
			CO:4 To familiarize the sources of energy, power plant economics and environmental aspects
			CO:5 To make the students to understand the basics concept of Boilers & I.C. engines.
15	I/II	**BASIC CIVIL AND MECHANICAL ENGINEERING LAB**	CO:1 To make the student learn about the constructional features and operational details of various types of internal combustion engines
			CO:2 To make the student learn about the constructional features, operational details of various types of hydraulic turbines
			CO:3 To practice the student about the fundamental of fluid dynamic equations and its applications fluid jets
16	I/II	**APPLIED PHYSIC LAB**	CO:1 Determination of wavelength of a source-Diffraction Grating-Normal incidence.
			CO:2 Newton's rings – Radius of Curvature of Plano - Convex Lens.
			CO:3 Determination of thickness of a spacer using wedge film and parallel interference fringes
17	I/II	**DATA STRUCTURES THROUGH C LAB**	CO:1 To develop skills to design and analyze simple linear and non linear data structures.
			CO:2 To strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem
			CO:3 To gain knowledge in practical applications of data structures
18	I /II	**CONSTITUTION OF INDIA**	CO:1 To Enable the student to understand the importance of constitution
			CO:2 To understand the structure of executive, legislature and judiciary
			CO:3 To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India
			CO:4 To understand the central and state relation financial and administrative.

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19	II/I	**ELECTRICAL CIRCUIT ANALYSIS-II**	CO:1 To study the concepts of balanced and unbalanced three-phase circuits.
			CO:2 To study the transient behavior of electrical networks with DC, pulse and AC excitations.
			CO:3 To study the performance of a network based on input and output excitation/response
			CO:4 To understand the realization of electrical network function into electrical equivalent passive elements.
			CO:5 To understand the application of fourier series and fourier transforms for analysis of electrical circuits.
20	II/I	**DC MACHINES AND TRANSFORMERS**	CO:1 To Understand the construction, principle of operation and performance of DC machines
			CO:2 To Learn the characteristics, performance, methods of speed control and testing methods of DC motors
			CO:3 To predetermine the performance of single phase transformers with equivalent circuit models
			CO:4 To Understand the methods of testing of single-phase transformer
			CO:5 To Analyze the three phase transformers and achieve three phase to two phase conversion
21	II/I	**ELECTRONIC DEVICES AND CIRCUITS**	CO:1 The application of diodes as rectifiers with their operation and characteristics with and without filters are discussed .
			CO:2 Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes
			CO:3 The principal of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics are explained.
			CO:4 The need of transistor biasing and its significance is explained. The quiescent point or operating point is explained

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			CO:5 Small signal equivalent circuit analysis of BJT and FET transistor amplifiers in different configuration is explained.☐
22	II/I	**ELECTROMAGNETIC FIELDS**	CO:1 To study the production of electric field and potentials due to different configurations of static charges. .
			CO:2 To study the properties of conductors and dielectrics, calculate the capacitance of different configurations. Understand the concept of conduction and convection current densities.
			CO:3 To study the magnetic fields produced by currents in different configurations, application of Ampere's law and the Maxwell's second and third equations.
			CO:4 To study the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops.
			CO:5 To develop the concept of self and mutual inductances and the energy stored.
23	II/I	**MATHEMATICS-IV**	CO:1 To familiarize the complex variables.
			CO:2 To familiarize the students with the foundations of probability and statistical methods.
			CO:3 To equip the students to solve application problems in their disciplines.
24	II/I	**DC MACHINES AND TRANSFORMERS LAB**	CO:1 To plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.☐
			CO:2 To control the speed of DC motors.
			CO:3 To determine and predetermine the performance of DC machines.☐
25	II/I	**ELECTRONIC DEVICES AND CIRCUITS LAB**	CO:2 To study the characteristics of electronic components and measuring instruments
			CO:2 To understand the characteristics of PN, Zener diode, design rectifiers with and without filters
			CO:3 To understand the biasing of transistors☐

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26	II/I	**ELECTRICAL CIRCUITS LAB**	CO:1 To verify and demonstrate various theorems and resonance.
			CO:2 To draw the locus diagram of series circuits
			CO:3 To determine the various parameters of a two port networks
			CO:4 To determine self and mutual inductance of a magnetic circuit, parameters of a given coil
			CO:5 To measure the power of three phase unbalanced circuit
27	II/I	**SKILL ORIENTED COURSE** **DESIGN OF ELECTRICAL CIRCUITS USING ENGINEERING SOFTWARE TOOLS**	CO:1 To Learn the fundamentals of MATLAB Tools
			CO:2 To generate various waveform signals and sequences
			CO:3 To verify and simulate various electrical circuits using Mesh and Nodal Analysis
			CO:4 To verify and simulate various theorems☐
			CO:5 To verify and simulate RLC series and parallel resonance
28	II/I	**PROFESSIONAL ETHICS & HUMAN VALUES**	CO:1 To create an awareness on Engineering Ethics and Human Values
			CO: 2 To instill Moral and Social Values and Loyalty
			CO:3 To appreciate the rights of others
			CO:4 To create awareness on assessment of safety and risk
			CO:5 To study the principle of operation and working of DVMS, Power analyser and applications of CRO.
29	II/II	**PYTHON PROGRAMMING**	CO:1 To learn about Python programming language syntax, semantics, and the runtime environment
			CO:2 To be familiarized with universal computer programming concepts like data types, containers
			CO:3 To be familiarized with general computer programming concepts like conditional execution, loops & functions
			CO:4 To be familiarized with general coding techniques and object-oriented programming .
			CO:5 To Introduction to Programming Concepts with Scratch.

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30	II/II	**DIGITAL ELECTRONICS**	CO:1 To solve a typical number base conversion and analyze new error coding techniques.
			CO:2 Theorems and functions of Boolean algebra and behavior of logic gates.
			CO:3 To optimize logic gates for digital circuits using various techniques.
			CO:4 To understand concepts of combinational circuits.
			CO:5 To develop advanced sequential circuits.
31	II/II	**INDUCTION AND SYNCHRONOUS MACHINES**	CO:1 Understand the principle of operation and performance of 3-phase induction motor.
			CO:2 Quantify the performance of induction motor and induction generator in terms of torque and slip.
			CO:3 To understand the torque producing mechanism of a single phase induction motor
			CO:4 To study parallel operation and control of real and reactive powers for synchronous generators.
			CO:5 To understand the operation, performance and starting methods of synchronous motors.
32	II/II	**POWER SYSTEMS-I**	CO:1 To study the principle of operation of different components of a thermal power stations.
			CO:2 To study the principle of operation of different components of a Nuclear power stations
			CO:3 To study the constructional and operation of different components of an Air and Gas Insulated substations
			CO:4 To study the constructional details of different types of cables.
			CO:5 To study different types of load curves and tariffs applicable to consumers.
33	II/II	**MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS**	CO:1 The Learning objectives of this paper are to understand the concept and nature of Managerial Economics and its relationship with other disciplines and also to understand the Concept of Demand and Demand forecasting.

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			CO:2 To familiarize about the Production function, Input Output relationship, Cost-Output relationship and Cost-Volume-Profit Analysis.□
			CO:3 To understand the nature of markets, Methods of Pricing in the different market structures and to know the different forms of Business organization and the concept of Business Cycles.□
			CO:4 To learn different Accounting Systems, preparation of Financial Statement and uses of different tools for performance evaluation
			CO:5 Finally, it is also to understand the concept of Capital, Capital Budgeting and the techniques used to evaluate Capital Budgeting proposals.
34	II/II	**PYTHON PROGRAMMING LAB**	CO:1 To acquire programming skills in core Python
			CO:2 To acquire Object Oriented Skills in Python .
			CO:3 To develop the skill of designing Graphical user Interfaces in Python
			CO:4 To develop the ability to write database applications in Python
35	II/II	**INDUCTION AND SYNCHRONOUS MACHINES LAB**	CO:1 Speed control methods of three-phase induction motors
			CO:2 Performance characteristics of three-phase and single-phase induction motors
			CO:3 Principles of power factor improvement of single-phase induction motor.□
			CO:4 Voltage regulation calculations of three–phase alternator by various methods,
			CO:5 Performance curves of three-phase synchronous motor.□
36	II/II	**DIGITAL ELECTRONICS LAB**	CO:1 To know the concept of Boolean laws for simplifying the digital circuits
			CO:2 To understand the concepts of flipflops.□
			CO:3 To understand the concepts of counters.
			CO:4 To analyze and design various circuits.□
			CO:5 Identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
37	II/II	**SKILL ORIENTED COURSE IOT APPLICATIONS OF ELECTRICAL ENGINEERING**	CO: To understand fundamentals of various technologies of Internet of Things
			CO:2 To know various communication technologies of Things

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			CO:3 To know the connectivity of devices using web and internet in the IoT environment.
			CO:4 To understand the implementation of IoT by studying case studies like Smart Home, Smart city, etc.
38	III/I	**POWER SYSTEMS–II**	CO:1 To compute inductance/capacitance of transmission lines and to understand the concepts of GMD/GMR
			CO:2 To study the short and medium length transmission lines, their models and performance
			CO:3 To study the effect of travelling waves on transmission lines.
			CO:4 To study the factors affecting the performance of transmission lines and power factor improvement methods.
			CO:5 To discuss sag and tension computation of transmission lines as well as to study the performance of overhead insulators.
39	III/I	**POWER ELECTRONICS**	CO:1 To study the characteristics of various power semiconductor devices and to design firing circuits for SCR
			CO:2 To understand the operation of single phase full–wave converters and analyze harmonics in the input current
			CO:3 To study the operation of three phase full–wave converters.
			CO:4 To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation
			CO: 5 To analyze the operation of AC-AC regulators.
40	III/I	**CONTROL SYSTEMS**	CO:1 To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
			CO:2 To analyze the time response of first and second order systems and improvement of performance using PI, PD, PID controllers. To investigate the stability of closed loop systems using Routh's stability criterion and root locus method.
			CO:3 To understand basic aspects of design and compensation of LTI systems using Bode diagrams

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			CO:4 To learn Frequency Response approaches for the analysis of LTI systems using Bode plots, polar plots and Nyquist stability criterion.
			CO:5 To learn state space approach for analysis of LTI systems and understand the concepts of controllability and observability
41	III/I	**UTILIZATION OF ELECTRICAL ENERGY**	CO 1 To study the basic principles of illumination and its measurements and to design the different types lighting systems
			CO 2 To acquaint with the different types of heating and welding techniques
			CO 3 To understand the operating principles and characteristics of various motors with respect to speed, temperature and loading conditions.
			CO 4 To understand the basic principles of electric traction including speed–time curves of different traction services and calculation of braking, acceleration and other related parameters
			CO 5 To Introduce the concepts of various types of energy storage systems.
42	III/I	**Principles of Communications**	CO:1 Analyze the performance of analog modulation schemes in time and frequency domains.
			CO:2 Analyze the performance of angle modulated signals.
			CO:3 Characterize analog signals in time domain as random processes and noise
			CO:4 Characterize the influence of channel on analog modulated signals
			CO:5 Determine the performance of analog communication systems in terms of SNR
43	III/I	**POWER ELECTRONICS LABORATORY**	CO:1 To learn the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
			CO:2 To analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads.
			CO:3 To understand the operation of AC voltage regulator with resistive and inductive loads.
			CO:4 To understand the working of Buck converter and Boost converter.
			CO:5 To understand the working of single-phase & three-phase inverters.
44	III/I	**CONTROL SYSTEMS LABORATORY**	CO:1 To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers

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			:
			CO:2 D.C. servo motors, A.C. Servo motors and Synchros.
			CO:3 To understand time and frequency responses of control system with and without controllers and compensators
45	III/I	**SOFT SKILL COURSE EMPLOYABILITY SKILLS**	CO:1 To enhance the Numerical ability skills such as addition, subtraction, multiplication, division, calculation of percentages, average etc.
			CO:2 To develop the problem solving skills on time, distance and speed calculations, to improve the basic mathematical skills on arithmetic ability.
			CO:3 To analyze a candidate's ability to relate a certain given group of items and illustrate it diagrammatically
			CO:4 To develop interpersonal skills and adopt good leadership behavior for empowerment of self and others.by managing stress and time effectively
			CO:5To prepare good resume, prepare for interviews and group discussions, and to explore desired career opportunities
46	III/I	**ENVIRONMENTAL SCIENCE**	CO:1 Overall understanding of the natural resources.
			CO:2 Basic understanding of the ecosystem and its diversity.
			CO:3 Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
			CO:4 An understanding of the environmental impact of developmental activities
			CO:5 Awareness on the social issues, environmental legislation and global treaties
47	III/II	ELECTRIC DRIVES	CO:1 To learn the fundamentals of electric drive and different electric braking methods
			CO:2 To analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
			CO:3 To discuss the converter control of dc motors in various quadrants.
			CO:4 To understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters

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			CO:5 To understand the speed control mechanism of synchronous motors
48	III/II	**POWER SYSTEM ANALYSIS**	CO:1 To development the impedance diagram (p.u) and formation of Y_{bus}
			CO:2 To study the different load flow methods
			CO:3 To study the concept of the Z_{bus} building algorithm.
			CO:4 To study short circuit calculation for symmetrical faults
			CO:5 To study the effect of unsymmetrical faults and their effects.
49	III/II	**MICROPROCESSORS AND MICROCONTROLLERS**	CO:1 To understand the organization and architecture of Microprocessor
			CO:2 To understand addressing modes to access memory
			CO:3 To understand 8051 micro controller architecture
			CO:4 To understand the programming principles for 8086 and 8051
			CO:5 To understand the interfacing of Microprocessor with I/O as well as other devices
50	III/II	**ELECTRICAL MEASUREMENTS AND INSTRUMENTATION**	CO:1 To understand and analyze the factors that effect the various measuring units.
			CO:2 To choose the appropriate meters for measuring of voltage, current, power, power factor and energy qualities & understand the concept of standardization
			CO:3 Describe the operating principle of AC & DC bridges for measurement of resistance, inductance and capacitance
			CO:4 To understand the concept of the transducer and their effectiveness in converting from one form to the other form for the ease of calculating and measuring purposes.
			CO:5 To understand the operating principles of basic building blocks of digital systems, record and display units.
51	III/II	**Basic electronics**	CO:1 Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
			CO:2 Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons
			CO:3 Understand the construction, principle of operation of

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			transistors,
			CO:4 To Characteristics and Parameters
52	III/II	**ELECTRICAL MEASUREMENTS AND INSRUMENTATION LABORATORY**	CO:1 To understand students how different types of meters work and their construction.
			CO:2 To make the students understand how to measure resistance, inductance and capacitance by AC & DC bridges
			CO:3 To understand the testing of CT and PT.
			CO:4 To study the procedure for standardization and calibration of various methods
53	III/II	**POWER SYSTEMS AND SIMULATION LAB**	CO:1 Estimate the sequence impedances of 3-phase Transformer and Alternators
			CO:2 Evaluate the performance of transmission lines
			CO:3 Analyse and simulate power flow methods in power systems
			CO:4 Analyse and simulate the performance of PI controller for load frequency control.
			CO:5 Analyse and simulate stability studies of power systems
54	III/II	**MICRO PROCESSORS AND MICRO CONTROLLERS LAB**	CO:1 To study programming based on 8086 microprocessor and 8051 microcontroller
			CO:2 To study 8086 microprocessor based ALP using arithmetic, logical and shift operations.
			CO:3 To study to interface 8086 with I/O and other devices.
			CO:4 To study parallel and serial communication using 8051& PIC 18 micro controllers.

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Electrical & Electronics Engineering I & II Sem Course outcomes for the Academic year 2020- 2021

S.NO.	YEAR/ SEM	COURSE NAME	Course Outcomes
55	III/II	SKILL ADVANCED COURSE MACHINE LEARNING WITH PYTHON	**CO1:** patterns and concepts from data without being explicitly programmed in various IOT nodes.
			CO2: to design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
			CO3: to explore supervised and unsupervised learning paradigms of machine earning, Deep learning technique and various feature extraction strategie
56	III/II	RESEARCH METHODO LOGY	**CO1:** To understand the objectives and characteristics of a research problem
			CO2: To analyze research related information and to follow research ethics
			CO3: To understand the types of intellectual property rights.
			CO4: To learn about the scope of patent rights.
			CO5: To understand the new developments in IPR.
57	IV/I	FLEXIBLE ALTERNAT ING CURRENT TRANSMIS	**CO1:** To learn the basics of power flow control in transmission lines using FACTS controllers
			CO2: To explain operation and control of voltage source converter.
			CO3: To learn the method of shunt compensation using static VAR compensators

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		SION SYSTEMS THROUGH JAVA	**CO4:** To learn the methods of compensation using series compensators
			CO5: To explain operation of Unified Power Flow Controller (UPFC) and Interline Power flow Controller (IPFC).
58	**IV/I**	**HIGH VOLTAGE ENGINEERING**	**CO1**: To understand HV breakdown phenomena in gases.
			CO2: To understand the breakdown phenomenon of liquids and solid dielectrics.
			CO3:. To acquaint with the generating principle of operation and design of HVDC, AC voltages.
			CO4: To understand the generating principles of Impulse voltages & currents
			CO5: To understand various techniques for AC, DC and Impulse measurements of high voltages and currents
59	**IV/I**	**POWER SYSTEM OPERATION AND CONTROL**	**CO1:** To understand optimal dispatch of generation with and without losses.
			CO2: To understand the optimal scheduling of hydro thermal systems
			CO3: To understand the optimal unit commitment problem.
			CO4: To understand the load frequency control for single area system with and without controllers
			CO5: To understand the load frequency control for two area system with and without controllers
60	**IV/I**	**HIGH VOLTAGE ENGINEERING**	**CO1:** To understand HV breakdown phenomena in gases, liquids and solids dielectrics.
			CO2: To acquaint with the generating principle of operation and design of HVDC, AC and Impulse voltages and currents.
			CO3: To understand various techniques for AC, DC and Impulse measurement of high voltages and currents. .
			CO4: To understand the insulating characteristics of dielectric materials.
			CO5: To understand the various testing techniques of HV equipments.
	IV/I	**UNIVERSAL HUMAN VALUES-2: UNDERSTA**	**CO1:** To Need, Basic Guidelines, Content and Process for Value Education
			CO2: To Understanding Harmony in the Human Being - Harmony in Myself!

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61		**NDING HARMONY**	**CO3** To Understanding Harmony in the Family and Society-Harmony in Human Relationship.
			CO4: To Understanding Harmony in the Nature and Existence - Whole existence as Coexistence
			CO5: To Implications of the above Holistic Understanding of Harmony on Professional Ethics
62	IV/I	**SKILL ADVANCED COURSE MACHINE LEARNING WITH PYTHON LAB**	**CO1:** To Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate MLmodels
			CO2: Implement procedures for the machine learning algorithms.
			CO3: Design and Develop Python programs for various Learning algorithms
			CO4: Apply appropriate data sets to the Machine Learning algorithms
			CO5: Develop Machine Learning algorithms to solve real world problems
63	IV/I	**INDUSTRIAL ELECTRONICS**	**CO1:** Understand the concept of DC amplifiers
			CO2: Analyze and design different voltage regulators for real time applications
			CO3: Describe the basis of SCR and Thyristor
			CO4: Determine the performance of DIAC and TRIAC
			CO5: Develop real time application using electronics
64	IV/I	**Digital Logic design**	**CO1:** Classify different number systems and apply togenerate various codes
			CO2: Use the concept of Boolean algebra in minimization of switching functions
			CO3: Design different types of combination allogic circuits
			CO4: Apply knowledge offlip-flops in designing of Registers and counters
			CO5: The operation and design methodology for synchronous sequential circuits and algorithmic state machines

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Department of Electronic Communication and Engineering M-Tech

Communication systems   2023-2024

S.No.	Year/Sem	Course Name	Course Outcomes
		Department of Electronic Communication and Engineering	
1	I/I	**Digital Data Communications**	**CO1:** Model digital communication system using appropriate mathematical techniques (error probability, constellation diagrams, pharos diagrams).
			CO2: Understanding the basic concepts of how digital data is transferred across computer networks
			CO3: Independently understand basic computer network technology.
2	I/I	**Advanced Digital Signal Processing**	**CO1:** design and implement the digital filters (both FIR & IIR).
			CO2: Discribe sampling rate conversion and multi-rate signal processing, in the digital domain.
			CO3: Apply the concepts of sampling rate conversion in the implementation of digital filter banks, quadrature mirror filters and their use in sub-band coding. .
			CO4: To understand theory of forward-backward linear prediction filters and solution of normal equations
			CO5: Understand Adaptive filtering and the concepts of non-parametric methods of power spectrum estimation
3	I/I	**Elective I** **I. Radar Signal Processing**	**CO1:** Understand the operation of Radar and characteristics of Matched filter for non-white noise.
			CO2: Understand the various detection criterion and types of detectors that can be used to detect the Radar signals in noise .
			CO3: Understand the waveform design requirements and optimum waveforms for the detection of signals in clutter
			CO4: Know the significance and types of pulse compression techniques for analog and digital signals.
			CO5: Understand the requirements of phase coding in Radar and various

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polyphase codes used for phase coding

4		**II.RF Circuit Design**	**CO1:** Understand the behaviour of RF passive components and model active components.
			CO2: Perform transmission linear analysis
			CO3: Demonstrate use of Smith Chart for high frequency circuit design.
			CO4: Justify the choice/selection of components from the design aspects.
5		**III. Advanced Computer Networks**	**CO1:** Able to Define Congestion and Quality of Service and Illustrate reference models with layers, protocols and interfaces.
			CO2: Familiar with the basic protocols of computer networks, and how they can be used to assist in network design and implementation
			CO3: Understand the general principles behind , addressing, routing, reliable transmission and other state full protocols
			CO4: Have an informed view of both the internal workings of the Internet and of a number of common Internet applications and protocol
			CO5: Familiar with the basic cellular concepts and understand the importance of multiple accessing schemes.
6	I/I	**Elective II** **I. Wireless LANs and PANs**	**CO1:** Conversant with the latest 3G/4G and Wi-MAX networks and its architecture. CO3: Implement different type of applications for smart phones and mobile devices with latest network strategies CO4: Compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks.
			CO2: Design and implement wireless network environment for any application using latest wireless protocols and standards.
			CO3: Implement different type of applications for smart phones and mobile devices with latest network strategies
			CO4: Compare and contrast multiple division techniques, mobile communication systems, and existing wireless networks.
			CO5: Classify network protocols, ad hoc and sensor networks, wireless MANs, LANs and PANs
7		**II. Mobile Computing**	**CO1:** Define mobile technologies in terms of hardware, software, and communications.

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		Technologies	4. Describe how mobile technology functions to enable other computing technologies.
			CO2: Utilize mobile computing nomenclature to describe and analyze existing mobile computing frameworks and architectures.
			CO3: Evaluate the effectiveness of different mobile computing frameworks
			CO4: Describe how mobile technology functions to enable other computing technologies
8		**III. Network Security & Cryptography**	**CO1:** Identify and utilize different forms of cryptography techniques.
			CO2: Incorporate authentication and security in the network applications
			CO3: Distinguish among different types of threats to the system and handle the same.
9	I/I	**Data Communications Laboratory**	**CO1:** Student will be able to understand network communication using the layered concept, Open System Interconnect (OSI) and the Internet Model.
10	I/I	**Advanced Digital Signal processing lab**	**CO1:** Filter design
			CO2: Filter Realization
			CO3: Signal Manipulations
			CO4: Wavelet Transforms
			CO5: Estimating PSD using various techniques
11	I/I	**Research Methodology and IPR**	**CO1:** Understand research problem formulation. Follow research
			CO2: Analyze research related information
			CO3: Follow research ethics
			CO4: Understand that today"s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
			CO5: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
12	I/II	**WIRELESS**	**CO1:** Understand Cellular communication concepts

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		COMMUNICATIONS	**CO2** Study the mobile radio propagation
		AND NETWORKS	**CO3:** Study the wireless network different type of MAC protocols
13	I/II	**IMAGE AND VIDEO PROCESSING**	**CO1** Defining the digital image, representation of digital image, importance of image resolution, applications in image processing..
			CO2: Know the advantages of representation of digital images in transform domain, application of various image transforms.
			CO3: Know how an image can be enhanced by using histogram techniques, filtering techniques etc.
			CO4: Understand image degradation, image restoration techniques using spatial filters and frequency domain
			CO5: Know the detection of point, line and edges in images, edge linking through local processing, global processing
14	I/II	**Elective III** **I. Soft Computing Techniques**	**CO1**: Understand the basic concepts of Artificial neural network systems.
			CO2: Understand the McCulloch-Pitts neuron model, simple and multilayer Perception, Adeline and Madeline concepts
			CO3: Data processing, Hopfield and self-organizing network.
			CO4: Difference between crisp sets to fuzzy sets, fuzzy models, fuzzification, inference, membership functions, rule based approaches and defuzzification.
15		**II. Internet Protocols**	**CO1:** Understanding basic network routing concepts and algorithms;
			CO2: Understanding how to apply them into given topologies;
			CO3: Understanding how the Internet protocol suite operates; describe the functions of various protocols
			CO4: Explain the concept and usage of node addressing; classify addresses into network layers
16		**III. Cyber Security**	**CO1**: Cyber Security architecture principles.
			CO2: Identifying System and application security threats and

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			vulnerabilities
			CO3: Identifying different classes of attacks
17	I/II	**Elective IV** **I. Optical Networks**	**CO1**: Contribute in the areas of optical network and WDM network design.
			CO2: Implement simple optical network and understand further technology developments for future enhanced network
18		**II. DSP Processors and Architectures**	**CO1:** Identify and formalize architectural level characterization of P-DSP hardware.
			CO2: Ability to design, programming (assembly and C), and testing code using Code Composer Studio environment
			CO3: 3. Deployment of DSP hardware for Control, Audio and Video Signal processing applications
			CO4: 4. Understanding of major areas and challenges in DSP based embedded systems
19		**III. Radio and Navigational Aids**	**CO1:** Acquired knowledge about Radar and Radar Equations. 2. Understanding the working principal of MTI and Pulse Doppler Radar. 3. ability to work using Detection of Signals in Noise and Radio Direction Finding. 4. ability to work using Instrument Landing System. 5. Ability to work with Satellite Navigation System.
			CO2: Understanding the working principal of MTI and Pulse Doppler Radar..
			CO3: ability to work using Detection of Signals in Noise and Radio Direction Finding.
			CO4: Ability to work using Instrument Landing System.
			CO5: Ability to work with Satellite Navigation System.
20	I/II	**ADVANCED COMMUNICATIONS LAB**	**CO1:** Identify the different types of network devices and their functions within a network.
			CO2: Understand and build the skills of sub-netting and routing

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			mechanisms.
			CO3: Understand basic protocols of computer networks, and how they can be used to assist in network design and implementation..
21	I/II	**Advanced Digital Image and Video Processing lab**	**CO1:** Perform image and video enhancement
			CO2: Perform image and video segmentation
			CO3: Detect an object in an image/video
22	II/I	**ELECTIVE V** **I. Detection & Estimation Theory**	**CO1** Simulate signals and noise
			CO2: Detect signals in the presence of noise
			CO3: Compare various estimation techniques.
23		**II. Coding Theory and Applications**	**CO1:** Learning the measurement of information and errors.
			CO2: Obtain knowledge in designing Linear Block Codes and Cyclic codes.
			CO3: Construct tree and trellies diagrams for convolution codes
			CO4: Design the Turbo codes and Space time codes and also their applications
24		**III. Software Defined Radio**	**CO1:** Understand the principles of Software Defined Radio.(L2)
			CO2: Choose appropriate digital signals for RF signal processing/ implementation. (L3)
			CO3: Apply Digital Signal Synthesis for Generation and Implementation.(L3)
			CO4: Analyse RF Signals and digital systems. (L4)
25	II/I	**Open Elective** **1. Business Analytics**	**CO1**: Students will demonstrate knowledge of data analytics.
			CO2: Students will demonstrate the ability of think critically in making decisions based on data and deep analytics.
			CO3: Students will demonstrate the ability to use technical skills in

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			predictive and prescriptive modeling to support business decision-making.
			CO4: Students will demonstrate the ability to translate data into clear, actionable insights
26		**2. Industrial Safety**	**CO1**:Analyze the effect of release of toxic substances ·
			CO2:Understand the industrial laws, regulations and source models.
			CO3:Apply the methods of prevention of fire and explosions. ·
			CO4:Understand the relief and its sizing methods. ·
			CO5:Understand the methods of hazard identification and preventive measures.
27		**3. Operations Research**	**CO1**: Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
			CO2: Students should able to apply the concept of non-linear programming.
			C03: Students should able to carry out sensitivity analysis
			CO4: Student should able to model the real world problem and simulate it
		4. Cost Management of	**CO1:** Discuss various construction costs to manage a

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		Engineering Projects	construction project.
28			**CO2:** Summarize different construction activities and its application related to cost based on the field requirements.
			CO3: Identify Cost Behaviour of various types of cost and Quality Management
			CO4: Identifying various construction Budgets involved Cost Management process. 5. Discussing various types of Techniques and Problem-solving techniques involved in Construction
			CO5: Discussing various types of Techniques and Problem-solving techniques involved in Construction
29		5. Composite Materials	**CO1:** Explain the mechanical behavior of layered composites compared to isotropic materials.
			CO2: Apply constitutive equations of composite materials and understand mechanical behavior at micro and macro levels.
			CO3: Determine stresses and strains relation in composites materials.
30		6. WASTE TO ENERGY	**CO1:** Become aware of global energy scenarios
			CO2: Understand actions that can be applied in the context of environmental protection and sustainability
			CO3: Develop skills on main principles of chemical and

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			biotechnological waste-to-energy processes
			CO4: Understand the advantages of waste-to-energy conversion and their difficulties to be implemented
			CO5: Known and apply tools for the techno-economic analysis of the studied processes
40	II/I	DISSERTATION PHASE - I	**CO1:** Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem.
			CO2: Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design
41	II/II	DISSERTATION PHASE - II	**CO1:** Presenting the work in International/ National conference or reputed journals

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M.Tech ECE

EMBEDED SYSTEM AND VLSI2023-2024

M.Tech ECE I&II Sem Course Outcomes for the Academic Year			
S.No.	Year/Sem	Course Name	Course Outcomes
1	I/I	**RTL Simulation and Synthesis with PLDs** **Course Objecti** n	**CO1:** Develop the Verilog HDL to design a digital circuit. Appreciate the analysis of finite state machine of a controlling circuit
			CO2: Appreciate the analysis of finite state machine of a controlling circuit
			CO3: Verify the functionality of the digital designs using PLDs Discuss the shift from paper to digital communication.
2	I/I	**Micro controllers and Programmable Digital Signal Processors** s	**CO1:** Compare and select ARM processor core based SoC with several features/peripherals based on requirements of embedded applications.
			CO2: Identify and characterize architecture of Programmable DSP Processors .

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			CO3: Develop small applications by utilizing the ARM processor core and DSP processor based platform.
3	I/I	**DIGITAL SIGNAL AND IMAGE PROCESSIG**	**CO1:** Analyze discrete-time signals and systems in various domains (i.e Time, Z and Fourier)
			CO2: Design the digital filters (both IIR and FIR) from the given specifications
			CO3: Analyze the quantization effects in digital filters and understand the basics of image sampling, quantization and image transforms.
			CO4: Understand the concepts of image enhancement, image restoration and image segmentation.
			CO5: Know the various methods involved in image compression and fundamentals in color image processing
			CO4: Implement and know the application of algorithms for sorting and pattern matching.
4	I/I	**PARALLEL PROCESSING**	**CO1:** Identify limitations of different architectures of computer
			CO2: Analysis quantitatively the performance parameters for different architectures
			CO3: Investigate issues related to compilers and instruction set based on type of architectures.

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		VLSI SIGNAL PROCESSING	**CO1:** Ability to modify the existing or new DSP architectures suitable for VLSI. 2. Understand the concepts of folding and unfolding algorithms and applications. 3. Ability to implement fast convolution algorithms. 4. Low power design aspects of processors for signal processing and wireless applications.
			CO2: Ability to implement fast convolution algorithms.
5	I/I		**CO3:** Low power design aspects of processors for signal processing and wireless applications.
		Programming Languages for Embedded Systems	**CO1:** Write an embedded C application of moderate complexity.
			CO2: Develop and analyze algorithms in C++. .
			CO3: Differentiate interpreted languages from compiled language
		System Design with Embedded Linux	**CO1:** AGet the familiarity about embedded Linux development model.

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			CO2: Write and debug applications and drivers in embedded Linux spec ifications
6	I/I		**CO3:** Understand and create Linux BSP for a hardware platform
			CO4: Understand the concepts of image enhancement, image restoration and image segmentation.
			CO5: Know the various methods involved in image compression and fundamentals in color image processing
			CO4: Implement and know the application of algorithms for sorting and pattern matching.
7	I/I	**CAD of Digital System**	**CO1:** Identify limitations of different architectures of computer
			CO2: Fundamentals of CAD tools for modelling, design, test and verification of VLSI systems. • Understand various phases of CAD, including simulation, physical design, test and verification. • Demonstrate knowledge of computational algorithms and tools for CAD
			CO3: Demonstrate knowledge of computational algorithms and tools

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			for CAD
		Research Methodology and IPR	**CO1:** Understand research problem formulation. • Analyze research related information • Follow research ethics • Understand that today"s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity. • Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular. • Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.**JAWAHARLAL NEHRU** **CO2:**Analyze research related information

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			CO3: Follow research ethics
			CO4: Understand that today''s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
			CO5: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be
			CO6: Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.
8	I/I	**RTL Simulation and Synthesis with PLDs Lab**	**CO1:** Compare and select ARM processor core based SoC with several features/peripherals based on requirements of embedded applications.
			CO2: Identify and characterize architecture of Programmable DSP Processors .

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			CO3: Develop small applications by utilizing the ARM processor core and DSP processor based platform.
		Micro controllers and Programmable Digital Signal Processors Lab `	**CO1:** Install, configure and utilize tool sets for developing
			CO2: Core SoC and DSP processor.
			CO3: Core SoC and DSP processor.
			CO4:Develop prototype codes using commonly available on and off chip peripherals on the
11	I/II	**Analog and Digital CMOS VLSI Design**	CO1:Appreciate the trade-offs involved in analog integrated circuit design.
			CO2:Understand and appreciate the importance of noise and distortion in analog circuits.
			CO3:Analyze complex engineering problems critically in the domain of analog IC design for conducting research.

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			CO4:Solve engineering problems for feasible and optimal solutions in the core area of digital ICs.
12	I/II	REALTIMR OPRATING SYSTEM	CO5::Demonstrate advanced knowledge in Static and dynamic characteristics of CMOS, Alternative CMOS Logics, Estimation of Delay and Power, Adders Design.
			CO1:Illustrate real time programming concepts. Apply RTOS functions to implement embedded applications
			CO1:**CO2:** Understand fundamentals of design consideration for embedded applications
13	I/II	**Memory Architectures** **(Elective III)**	**CO1:** Select architecture and design semiconductor memory circuits and subsystems.
			CO2: Identify various fault models, modes and mechanisms inarchitectures
			CO3: Know how the state-of-the-art memory chip design
		SoC Design	**CO1:** Develop the Verilog HDL to design a digital circuit. **CO2:**Identify and formulate a given problem in the framework of SoC

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		(Elective III)	based design approaches Design SoC based system for engineering applications
			CO3:Realize impact of SoC on electronic design philosophy and Macro-electronics thereby
15	I/II	**Low Power VLSI Design** **(Elective III)**	CO1: Identify the sources of power dissipation in digital IC systems & understand the impact of power on system performance and reliability.
			CO2: Characterize and model power consumption & understand the basic analysis methods.
16	I/II	Communication Buses and Interfaces **(Elective IV)**	CO1: Select a particular serial bus suitable for a particular application. ·
			CO2: Develop APIs for configuration, reading and writing data onto serial bus. ·
			CO3: Design and develop peripherals that can be interfaced to desired serial bus.
17	I/II	Network Security and Cryptography **(Elective IV)**	CO1: Identify and utilize different forms of cryptography techniques. ·
			CO2:Incorporate authentication and security in the network applications. · .
			C03:Distinguish among different types of threats to the system and handle the same.

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18	I/II	Physical design automation **Elective IV)**	**CO1:** Understand the relationship between design automation algorithms and Various constraints posed by VLSI fabrication and design technology. ·
			CO2: Adapt the design algorithms to meet the critical design parameters. ·
			CO3: Identify layout optimization techniques and map them to the algorithms ·
			CO4: Develop proto-type EDA tool and test its efficacy
19	I/II	Analog and Digital CMOS VLSI Design Lab	**CO1:** Analyze VI Characteristics NMOS and PMOS Devices.
			CO2: Analyze Voltage transfer characteristics of CMOS inverter.
			CO3: Demonstrate transient and ac analysis of CMOS inverter.
			CO4: Calculate small signal voltage gain of CS amplifier. CO5: Design the layout of a minimum size inverter.
			CO5: Design the layout of a minimum size inverter
20	I/II	Real Time Operating Systems Lab	**CO1:** Analyze basic concepts of operating system and their structures.
			CO2: Analyze various issues related to inter process communication like process scheduling, resource management and deadlocks.
			CO3: Interpret the issues and challenges of memory management.
			CO4: Synthesize the concepts of I/O management, file system implementation and problems related to security

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			and protection
21	I/II	Mini Project	**CO1:** Understand of contemporary / emerging technology for various processes and systems.
			CO2: Share knowledge effectively in oral and written form and formulate documents .
22	II/I	IOT and its Applications (Elective V)	**CO1:** Apply the Knowledge in IOT Technologies and Data management. ·
			CO2: Determine the values chains Perspective of M2M to IOT. ·
			CO3: Implement the state of the Architecture of an IOT.
			CO4: Compare IOT Applications in Industrial & real world.
			CO5: Demonstrate knowledge and understanding the security and ethical issues of an IOT
23	II/I	Hardware Software Co-Design (Elective V)	**CO1:** About the Hardware-Software Code sign Methodology.
			CO2: How to select a target architecture and how a prototype is built and how emulation of a prototype is done. ·
			CO3: Brief view about compilation technologies and compiler development environment. ·
			CO4: Understand the importance of system level specification languages and multi-language co-simulation.
24	II/I	Artificial Intelligence (Elective V)	**CO1:** Understand the concept of Artificial Intelligence, search techniques and knowledge representation issues ·
			CO2: Understanding reasoning and fuzzy logic for artificial intelligence ·

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			CO3: Understanding game playing and natural language processing
25	II/I	BUSINESS ANALYTICS (Open Elective)	**CO1:**Students will demonstrate knowledge of data analytics. ·
			CO2: Students will demonstrate the ability of think critically in making decisions based on data and deep analytics. ·
			CO3: Students will demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making. ·
			CO4: Students will demonstrate the ability to translate data into clear, actionable insights
26	II/I	**2. Industrial Safety**	**CO1:**Analyze the effect of release of toxic substances ·
			CO2: Understand the industrial laws, regulations and source models.
			CO3: Apply the methods of prevention of fire and explosions. ·
			CO4: Understand the relief and its sizing methods. ·
			CO5: Understand the methods of hazard identification and preventive measures.
27	II/I	**3. Operations Research**	**CO1**: Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.

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			CO2: Students should able to apply the concept of non-linear programming.
			C03: Students should able to carry out sensitivity analysis
			CO4: Student should able to model the real world problem and simulate it
28	II/II	**4. Cost Management of Engineering Projects**	**CO1:** Discuss various construction costs to manage a construction project.
			CO2: Summarize different construction activities and its application related to cost based on the field requirements.
			CO3: Identify Cost Behaviour of various types of cost and Quality Management
			CO4: Identifying various construction Budgets involved Cost Management process. 5. Discussing various types of Techniques and Problem-solving techniques involved in Construction
			CO5: Discussing various types of Techniques and Problem-solving techniques involved in Construction
		5. Composite Materials	**CO1:** Explain the mechanical behavior of layered composites compared to isotropic materials.
			CO2: Apply constitutive equations of composite materials and understand mechanical behavior at micro and macro

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			levels.
			CO3: Determine stresses and strains relation in composites materials.
29		6.WASTE TO ENERGY	CO1: Become aware of global energy scenarios
			CO2: Understand actions that can be applied in the context of environmental protection and sustainability
			CO3: Develop skills on main principles of chemical and biotechnological waste-to energy processes
			CO4: Understand the advantages of waste-to-energy conversion and their difficulties to be implemented
			CO5: Known and apply tools for the techno-economic analysis of the studied processes
30	II/I	DISSERTATION PHASE - I	CO1: Ability to synthesize knowledge and skills previously gained and applied to an in-depth study and execution of new technical problem. ·
			CO2: Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
31	II/II	DISSERTATION PHASE - II	CO1: Ability to present the findings of their technical solution in a written report
			CO2: Presenting the work in International/ National conference or reputed journals.

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
M.Tech, Electrical Machines and Drives (EM&D)
Course Outcomes for the Academic Year 2023-2024

S.No.	Year/Sem	Course Name	Course Outcomes
Electrical & Electronics Engineering M.Tech, Electrical Machines and Drives I,II&III Sem Course Outcomes for the Academic Year 2022-2023			
1	I/I	Electrical Machines Modeling and Analysis C	**CO1**: Analyze the characteristics of different types of DC motors to design suitable controllers for different applications. Apply the knowledge of reference frame theory for AC machines to model the induction and •
			CO2: Synchronous machines. Evaluate the steady state and transient behavior of induction and synchronous machines to propose
			CO3: the suitability of drives for different industrial applications
			CO4: Analyze the behavior of induction machines using voltage and torque equations.
2	I/I	ANALYSIS OF POWER ELECTRONIC CONVERTERS	**CO1:** Describe and analyze the operation of AC-DC converters.
			CO2: Analyze the operation of three phase inverters with PWM control
			CO:3 Study the principles of operation of multi- level inverters and their applications.
			CO:4 Analyze the operation of power factor correction converters .
3	I/I	PROGRAMMABLE LOGIC CONTROLLERS & APPLICATIONS	CO:1 have knowledge on PLC.
			CO:2 acquire the knowledge on programming of PLC.
			CO:3 understand different PLC registers and their description.
			CO:4 have knowledge on data handling functions of PLC.
			CO:5 know how to handle analog signal and converting of A/D in PLC.
4	I/I	HVDC TRANSMISSION& FLEXIBLE AC TRANSMISSION SYSTEMS	**CO:1** learn various schemes of HVDC transmission.
			CO:2 learn about the basic HVDC transmission equipment.
			CO:3 Apply impedance, phase angle and voltage control for real and reactive power flow in ac transmission systems with FACTS controller.
			CO:4 Analyze and select a suitable FACTS controller for a given power flow condition. .
5	I/I	RESEARCH METHODOLGY AND IPR	**CO1:** Meaning of research problem, Sources of research problem
			CO2: Effective literature studies approaches, analysis Plagiarism
			CO3: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development

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			CO4: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. .
			CO5: New Developments in IPR: Administration of Patent System. New developments in IPR .
6	**I/I**	POWER SYSTEM SIMULATION LABORATORY – I	CO1: understand the modelling of different transmission
			CO2: Understand the mathematical formulation of distribution system load flow
			CO3: Understand the configurations of transmission lines
			CO4: Understand the transients in transmission lines
			CO5: Understand the formation of Z- and Y-bus matrices
7	**I/I**	POWER CONVERTERS LABORATORY	Students are able to implement the converter and inverters in real time applications. .
8	**I/I**	CONSTITUTION OF INDIA	CO:1 Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
			CO:2 . Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India
			CO:3 Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
			CO:4 Discuss the passage of the Hindu Code Bill of 1956.
9	**I/II**	SWITCHED MODE POWER CONVERSION	CO:1 Analyze operation and control of non-isolated and isolated switch mode converters
			CO:2 Design of non-isolated and isolated switch mode converters
			CO:3 Analyze operation and control of resonant converters
			CO:4 Feedback design of switch mode converters based on linearized models
10	**I/II**	REAL TIME CONTROL OF POWER SYSTEMS	CO:1 Understand the emergence and evaluation of Indian constitution
			CO:2 Understand the structure and composition of Indian constitution
			CO:3 Understand and analyses federalism in the Indian context
			CO:4 Analyse panchayathi Raj institutions as a medium of decentralization

			CO:5 Understand and analyze the three organs of the state in the contemporary scenario
11	I/II	POWER ELECTRONIC CONTROL OF ELECTRICAL DRIVES	CO:1 Understand the concepts of scalar and vector control methods for drive systems. applications.
			CO:2 Analyze and design controllers and converters for induction motor, PMSM and BLDC drives
			CO:3 Select and implement proper control techniques for induction motor and PMSM for specific
			CO:4 Analyze and design control techniques and converters for SRM drives
12	I/II	DIGITAL CONTROL SYSTEMS	CO:1 Analyze digital control systems using Z-transforms and Inverse Z-Transforms
			CO:2 Evaluate the state transition matrix and solve state equation for discrete model for continuous time
			CO:3 Determine the stability; design state feedback controller.
			CO:4 Design an observer.
			CO:5 Solve a given optimal control problem.
13	I/II	MICROCONTROLLERS	CO:1 Design the interfacing circuits for input and output to PIC micro controllers and DSP processors..
			CO:2 Write ALP for DSP processors.
			CO:3 Design PWM controller for power electronic circuits using FPGA.
14	I/II	ELECTRIC DRIVES SIMULATION LABORATORY	The student should Understand the performance of DC & AC drives
15	I/II	PEDAGOGY STUDIES	CO:1 What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries .
			CO:2 ? What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
			CO:3 How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
16	I/III	SMART GRID TECHNOLOGIES	CO:1 Understand smart grids and analyze the smart grid policies and developments in smart grids.
			CO:2 Develop concepts of smart grid technologies in hybrid electrical vehicles etc.
			CO:3 Understand smart substations, feeder automation, GIS etc.
			CO:4 Analyze micro grids and distributed generation systems.

			CO:5 Analyze the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.
17	**I/III**	Energy Audit Conservation & Management	CO:1Understand the principle of energy audit and their economic aspects
			CO:2 Recommend energy efficient motors and design good lighting system
			CO: 3 Understand advantages to improve the power factor
			CO:4Evaluate the depreciation of equipment.

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
M.Tech, POWER SYSTEMS (PS)
Course Outcomes for the Academic Year 2023-2024

S.No.	Year/Sem	Course Name	Course Outcomes
		Electrical & Electronics Engineering M.Tech, Power Systems I,II&III Sem Course Outcomes for the Academic Year 2022-2023	
1	I/I	POWER SYSTEM OPERATION & CONTROL	**CO1**: study the unit commitment problem for economic load dispatch.
			CO2: study the load frequency control of single area and two area systems with and without control.
			CO3: study the effect of generation with limited energy supply
			CO4: study the effectiveness of interchange evaluation in interconnected power systems
2	I/I	ANALYSIS OF POWER ELECTRONIC CONVERTERS	**CO1**: understand the control principle of ac ac conversion with suitable power semi - conduc r devices.
			CO2: have the knowledge of ac dc conversion and different ac dc converter pologies.
			CO:3 understand the effect of operation of controlled rectifiers on p.f. and improvement of p.f. with PFC converters
			CO:4 acquire the knowledge on dc-ac converters and know the different control techniques of dc-ac converters.
			CO:5 know multilevel inverter configuration improve the quality of the inverter output voltage.
3	I/I	ELECTRICAL DISTRIBUTION AU MATION	**CO:1** learn the importance of economic distribution of electrical energy.
			CO:2 analyse the distribution networks for V-drops, PLosscalculations and reactive power
			CO:3 understand the co-ordination of protection devices
			CO:4 impart knowledge of capacitive compensation/voltage control.
			CO:5 understand the principles of voltage control.
4	I/I	HVDC TRANSMISSION	**CO:1** learn various schemes of HVDC transmission.
			CO:2 learn about the basic HVDC transmission equipment.
			CO:3 learn the control of HVDC systems.
			CO:4 be exposed the interaction between HVAC and HVDC system.
			CO:5 be exposed the various protection schemes of HVDC engineering
5	I/I	RESEARCH	**CO1**: Meaning of research problem, Sources of research problem

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		METHODOLGY AND IPR	**CO2:** Effective literature studies approaches, analysis Plagiarism
			CO3: Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development
			CO4: Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. .
			CO5: New Developments in IPR: Administration of Patent System. New developments in IPR .
6	I/I	POWER SYSTEM SIMULATION LABORA RY – I	CO1: understand the modelling of different transmission
			CO2: understand the mathematical formulation of distribution system load flow
			CO3: understand the configurations of transmission lines
			CO4: lines understand the transients in transmission lines
			CO5: understand the formation of Z- and Y-bus matrices
7	I/I	POWER SYSTEMS LABORA RY	After the Completion of lab they will understand procedure for determination of various parameters used in power system as well as performance of transmission line.
8	I/I	SANSKRIT FOR TECHNICAL KNOWLEDGE	CO:1 get a working knowledge in illustrious Sanskrit, the scientific language in the world The engineering scholars equipped with Sanskrit will be able explore the huge knowledge from ancient literatu
			CO:2 Learning of Sanskrit improve brain functioning
			CO:3 Learning of Sanskrit develop the logic in mathematics, science & other subjects enhancing the memory power
			CO:4 The engineering scholars equipped with Sanskrit will be able explore the huge knowledge from ancient literatu
9	I/II	POWER SYSTEM DYNAMICS AND STABILITY	CO:1 study the model of synchronous machines. study the effect of different excitation systems.
			CO:2 study the stability studies of synchronous machines.
			CO:3 study the solution method of transient stability.
			CO:4 study the effect of different excitation systems.
10	I/II	REAL TIME CONTROL OF POWER SYSTEMS	CO:1Understand the emergence and evaluation of Indian constitution
			CO:2Understand the structure and composition of Indian constitution
			CO:3Understand and analyses federalism in the Indian context

			CO:4 Analyse panchayathi Raj institutions as a medium of decentralization
			CO:5 Understand and analyze the three organs of the state in the contemporary scenario
11	I/II	FLEXIBLE AC TRANSMISSION SYSTEMS	CO1: study the performance improvements of transmission system with FACTS. .
			CO:2 study the effect of static shunt compensation
			CO:3 study the effect of static series compensation
			CO:4 study the effect of UPFC
12	I/II	PROGRAMMABLE LOGIC CONTROLLERS & APPLICATIONS	CO:1 have knowledge on PLC.
			CO:2 acquire the knowledge on programming of PLC.
			CO:3 understand different PLC registers and their description.
			CO:4 have knowledge on data handling functions of PLC.
			CO:5 know how handle analog signal and converting of A/D in PLC.
13	I/II	POWER SYSTEM SIMULATION LABORA RY-II	The student should analyze load flow solution obtained using GS and NR methods, symmetrical and unsymmetrical faults, Transient stability and load frequency deviation in single and two area systems
14	I/II	POWER CONVERTERS LABORA RY	Students are able implement the converter and inverters in real time applications.
15	I/II	VALUE EDUCATION	CO:1 Understand value of education and self- development Let the should know about the importance of character .
			CO:2 Imbibe good values in students
			CO:3 Let the should know about the importance of character .
16	I/III	SMART GRID TECHNOLOGIES	CO:1 understand concept of smart grid and developments on smart grid.
			CO:2 understand smart grid technologies and application of smart grid concept in hybrid electric vehicles etc.
			CO:3 have knowledge on smart substations, feeder au mation and application for moni ring and protection.
17	I/III	OPERATIONS RESEARCH	CO:1 understand the mathematical modelling of physical systems and its solving techniques with and without constraints.
			CO:2 understand the solving of LPP problem using graphical and simplex method.
			CO:3 understand the Solving of non-linear programming problem.
			CO:4 understand the scheduling and sequencing problem of different models with geometric programming.
			CO:5 understand the Solving of LPP using dynamic programming and graph

			theory.

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COMPUTER SCIENCE I&II Seem Course Outcomes for the Academic

Year 2023-2024

Computer Engineering I&II Sem Course Outcomes for the Academic Year 2019-2020			
S.No.	Year/Sem	Course Name	Course Outcomes
1	I/I	Mathematical Foundations of Computer Science	**CO1**:To apply the basic rules and theorems of probability theory such as Baye's Theorem, to determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
			CO2:Able to perform and analyze of sampling, means, proportions, variances and estimates the maximum likelihood based on population parameters.
			CO3:To learn how to formulate and test hypotheses about sample means, variances and proportions and to draw conclusions based on the results of statistical tests
			CO4:Design various ciphers using number theory
			CO5:Apply graph theory for real time problems like network routing problem.
2	I/I	Advanced Data Structures & Algorithms	**CO1**:Ability to write and analyze algorithms for algorithm correctness and efficiency
			CO2:Master a variety of advanced abstract data type (ADT) and data structures and their Implementation
			CO:Demonstrate various searching, sorting and hash techniques and be able to apply and solve problems of real life
			CO:Design and implement variety of data structures including linked lists, binary trees, heaps, graphs and search trees
			COAbility to compare various search trees and find solutions for IT related problems
3	I/I	Big Data Analytics	**CO:1**Illustrate on big data and its use cases from selected business domains..
			CO:2 Interpret and summarize on No SQL, Cassandraetermine the stresses and strains in the members subjected to axial bending
			CO:3 Analyze the HADOOP and Map Reduce technologies associated with big

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			data analytics and explore on Big Data applications Using Hive.
			CO:4 Make use of Apache Spark, RDDs etc. to work with datasets.
			CO:5 Assess real time processing with Spark Streaming.
4	I/I	Digital Image Processing	**CO:1** Demonstrate the components of image processing
			CO:2 Explain various filtration techniques
			CO:3 Apply image compression techniques. graduate level
			CO:4 Discuss the concepts of wavelet transforms
			CO:5 Analyze the concept of morphological image processing
5	I/I	ADVANCED COMPUTER NETWORKS	**CO1:**Illustrate reference models with layers, protocols and interfaces
			CO2: Describe the routing algorithms, Sub netting and Addressing of IP V4and IPV6..
			CO3 Describe and Analysis of basic protocols of computer networks, and how they can be used to assist in network design and implementation
			CO4: Describe the concepts Wireless LANS, WIMAX, IEEE 802.11, Cellular telephony and Satellite networks.
			CO5: Describe the emerging trends in networks-MANETS and WSN.
6	I/I	Advanced Operating Systems	CO1:Illustrate on the fundamental concepts of distributed operating systems, its architecture and distributed mutual exclusion
			CO2:Analyze on deadlock detection algorithms and agreement protocols.
			CO3:Make use of algorithms for implementing DSM and its scheduling.
			CO4:Apply protection and security in distributed operating systems.
			CO5:Elaborate on concurrency control mechanisms in distributed database systems
7	I/I	Internet of Things	CO1:Summarize on the term 'internet of things' in different contexts.

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			CO2:Analyze various protocols for IoT
			CO3:Design a PoC of an IoT system using Rasperry Pi/Arduino
			CO4Apply data analytics and use cloud offerings related to IoT.
			CO5:Analyze applications of IoT in real time scenario
8	I/I	Object Oriented Software Engineering	CO1:Apply the Object Oriented Software-Development Process to design software
			CO:2Analyze and Specify software requirements through a SRS documents.
			CO:3Design and Plan software solutions to problems using an object-oriented strategy.
			Co:4Model the object oriented software systems using Unified Modeling Language (UML)
			CO:5Estimate the cost of constructing object oriented software
9	I/I	Advanced Data Structures & Algorithms Lab	CO:1 Identify classes, objects, members of a class and relationships among them needed for a specific problem
			CO:2Examine algorithms performance using Prior analysis and asymptotic notations
			CO:3Examine algorithms performance using Prior analysis and asymptotic notations.
			CO:4Organize and apply to solve the complex problems using advanced data structures (like arrays, stacks, queues, linked lists, graphs and trees.)
			CO:5Apply and analyze functions of Dictionary
10	I/I	Advanced Computing Lab	CO:1The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Pi..

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			CO:2Development and use of IoT Technology in Societal and Industrial Applications.
			CO:3Skills to undertake high quality academic and industrial research in Sensors and IoT.
			CO:4To classify Real World IoT Design Constraints, Industrial Automation in IoT.
			CO:5
11	I/II	Machine Learning	CO1:Domain Knowledge for Productive use of Machine Learning and Diversity of Data.
			CO:2Demonstrate on Supervised and Computational Learning
			CO:3Analyze on Statistics in learning techniques and Logistic Regression
			CO:4Illustrate on Support Vector Machines and Perceptron Algorithm
			CO:5Design a Multilayer Perceptron Networks and classification of decision tree
12	I/II	MEAN Stack Technologies	CO:1After the completion of the course, student will be able to
			CO:2Identify the Basic Concepts of Web & Markup Languages.
			CO:3Develop web Applications using Scripting Languages & Frameworks.
			CO:4Make use of Express JS and Node JS frameworks
			CO:5Illustrate the uses of web services concepts like restful, react js.
13	I/II	Advanced Databases and Mining	CO:1Analyze on normalization techniques.
			CO:2Elaborate on concurrency control techniques and query optimization.
			CO:Summarize the concepts of data mining, data warehousing and data

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			preprocessing strategies.
			CO:4Apply data mining algorithms..
			CO:5Assess various classification & cluster techniques.
14	I/II	Ad Hoc & Sensor Networks	CO:1Explain the Fundamental Concepts and applications of ad hoc and wireless sensor networks
			CO:2Discuss the MAC protocol issues of ad hoc networks .
			CO:3Enumerate the concept of routing protocols for ad hoc wireless networks with respect to TCP design issues
			CO:4Analyze & Specify the concepts of network architecture and MAC layer protocol for WSN
			CO:5Discuss the WSN routing issues by considering QoS measurements
15	I/II	Soft Computing	CO:1Elaborate fuzzy logic and reasoning to handle uncertainty in engineering problems
			CO:2Make use of genetic algorithms to combinatorial optimization problems.
			CO:3Distinguish artificial intelligence techniques, including search heuristics, knowledge representation, planning and reasoning.
			CO:4Formulate and apply the principles of self-adopting and self organizing neuro fuzzy inference systems. .
			CO:5Evaluate and compare solutions by various soft computing approaches for a given problem
16	I/II	Cloud Computing	CO:1Interpret the key dimensions of the challenge of Cloud Computing.
			CO:2Examine the economics, financial, and technological implications for selecting cloud computing for own organization.
			CO:3Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications
17	I/II	Principles of Computer Security	CO:1Describe the key security requirements of confidentiality, integrity, and availability, types of security threats and attacks and summarize the functional requirements for computer security.
			CO:2Explain the basic operation of symmetric block encryption algorithms, use

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			of secure hash functions for message authentication, digital signature mechanism
			CO:3 Discuss the issues involved and the approaches for user authentication and explain how access control fits into the broader context that includes authentication, authorization, and audit.
			CO:4Explain the basic concept of a denial-of-service attack, nature of flooding attacks, distributed denial1of-service attacks and describe how computer security vulnerabilities are a result of poor programming practices.
			CO:5List the steps used to secure the base operating system, specific aspects of securing Unix/Linux systems, Windows systems, and security in virtualized systems and describe the security threats and countermeasures for wireless networks.
18	I/II	High Performance Computing	CO:1Design, formulate, solve and implement high performance versions of standard single threaded algorithms..
			CO:2Demonstrate the architectural features in the GPU and MIC hardware accelerators.
			CO:3Design programs to extract maximum performance in a multicore, shared memory execution environment processor.
			CO:4Analyze Symmetric and Distributed architectures.
			CO:5Develop and deploy large scale parallel programs on tightly coupled parallel systems using the message passing paradigm.
19	I/II	Machine Learning with Python Lab	CO:1Implement procedures for the machine learning algorithms
			CO:2Design Python programs for various Learning algorithms
			CO:3Apply appropriate data sets to the Machine Learning algorithms
			CO:4Identify and apply Machine Learning algorithms to solve real world problems
			CO:5

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20	I/II	MEAN Stack Technologies Lab	CO:1 Identify the Basic Concepts of Web & Markup Languages
			CO:2 Develop web Applications using Scripting Languages & Frameworks
			CO:3 Creating & Running Applications using JSP libraries.
			CO: 4 Creating Our First Controller Working with and Displaying in Angular Js and Nested Forms with ng1form
			CO:5 Working with the Files in React JS and Constructing Elements with Data.
21	II/I	Deep Learning	CO:1 Demonstrate the basic concepts fundamental learning techniques and layers.
			CO: 2 Discuss the Neural Network training, various random models.
			CO: 3 Explain different types of deep learning network models.
			CO: 4 Classify the Probabilistic Neural Networks.
			CO: 5 Implement tools on Deep Learning techniques.
22	II/I	Social Network Analysis	CO: 1 After the completion of the course, student will be able to
			CO:2 Design the axially loaded, uniaxial and biaxial bending columns
			CO3 :Analyze random graph models and navigate social networks data
			CO:4 Apply the network topology and Visualization tools
			CO:5 Analyze the experiment with small world models and clustering models

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Software Engineering I&II Sem Course Outcomes for the Academic Year 2023-2024

Software Engineering I&II Sem Course Outcomes for the Academic Year 2021-2022			
S.No.	**Year/Sem**	**Course Name**	**Course Outcomes**
1	**I/I**	Software Engineering	**CO1**:Demonstrate knowledge on: o Fundamental concepts of software engineering. o Process models. o Software development life cycle.
			CO2: Analyze software requirements and process models required to develop a software system.
			CO3: Design and develop a quality software product using design engineeringprinciples and Develop software product as per user and societal requirements.
			CO4: Follow standards for software development and quality management.
			CO5: Demonstrate skills in applying risk and quality management principles for effective management of software projects.
2	**I/I**	Advanced Data Structures	**CO1:**Ability to write and analyze algorithms for algorithm correctness and efficiency
			CO2: Master a variety of advanced abstract data type (ADT) and data structures and their Implementation.
			CO:3 Demonstrate various searching, sorting and hash techniques and be able to apply and solve problems of real life.
			CO:4 Design and implement variety of data structures including linked lists, binary trees, heaps, graphs and search trees.
			CO:5 Ability to compare various search trees and find solutions for IT related problems.
3	**I/I**	Software Project and Process Management	**CO:1**Apply the process to be followed in the software development life-cycle models..
			CO:2 Implement communication, modeling, and construction & deployment practices in software development.
			CO:3 Analyze & design the software models using unified modeling language

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			(UML) and the concepts of various software testing methods. .
			CO:4 Apply appropriate testing approaches for development of software and use the quality management metrics in software development.
			CO:5 Apply the concepts of project management & planning.
4	**I/I**	Machine Learning	**CO:1** Explain the definition and usage of the term 'the internet of things' in different contexts.
			CO:2 Demonstrate on various network protocols used in IoT.
			CO:3 Analyze on various key wireless technologies used in IoT systems, such as WiFi, 6LoWPAN, Bluetooth and ZigBee.
			CO:4 Illustrate on the role of big data, cloud computing and data analytics in IoT system.
			CO:5 Formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data
5	**I/I**	E-Commerce	**CO1:** Demonstrate an understanding of the foundations and importance of Ecommerce
			CO2: Analyze the impact of E-commerce on business models and strategyDiscuss legal issues and privacy in E-Commerce.
			CO3: Describe Internet trading relationships including Business to Consumer, Business-to-Business, Intra-organizational.
			CO4: Describe the infrastructure for E-commerce and describe the key features of Internet, Intranets and Extranets and explain how they relate to each other.
			CO5: Assess electronic payment systems and Recognize and discuss global Ecommerce issues .
6	**I/I**	Software Quality Assurance and Testing	CO1: Apply modern software testing processes in relation to software development and project management.
			CO2: Create test strategies and plans, design test cases, prioritize and

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			execute them.
			CO3: Manage incidents and risks within a project.
			CO4: Contribute to efficient delivery of software solutions and implement improvements in the software development processes.
			CO5: Gain expertise in designing, implementation and development of computer based systems and IT processes.
7	I/I	Cloud Computing	CO1: Ability to understand various service delivery models of a cloud computing architecture.
			CO2: The concept of Map-Reduce and how Map-Reduce works in analysis of data in parallel computing.
			CO3: Apply various Cloud Technologies, web services and software involved in cloud computing to design enterprise applications.
			CO4: Understand the challenges involved in cloud computing security and how VMs can be secured in Virtualization security management.
8	I/I	Internet of Things	CO:1 Grasp the idea behind Internet of Things (IoT).
			CO:2 Understand various business models relevant to IoT.
			CO:3 Understand designs for web connectivity.
			CO:4 Identify sources of data acquisition related to IoT, integrate to enterprise systems.
			CO:5 Understand IoT with Cloud technologies.
9	I/I	Advanced Data Structures Lab	CO:1 Identify classes, objects, members of a class and relationships among them needed for a specific problem.
			CO:2 Examine algorithms performance using Prior analysis and asymptotic notations

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			CO:3 Organize and apply to solve the complex problems using advanced data structures (like arrays, stacks, queues, linked lists, graphs and trees.)
			CO:4 Applyand analyze functions of Dictionary
10	I/I	SE LAB-I	CO:1 Make use of UML to develop the software project
			CO:2 Select Structural Modeling.
			CO:3 Utilize Behavioural and Architectural Modeling.
			CO:4 Examine estimation about schedule and cost for project development
			CO:5 Select project development tool.
11	I/II	Service Oriented Architecture	CO1: Creation of SOA compliant web service using various technologies
			CO:2 Make use of various service oriented analysis techniques also understand the technology underlying the service design.
			CO:3 Demonstrate on basic concepts of SOA and it differs with other architectures
			CO:4 Organize advanced concepts of service composition, Orchestration and Choreography. Understanding of web service framework with respect to SOA.
			CO:5 Identify various open standards available for developing SOA compliant web services.
12	I/II	Mathematical Foundations of Computer Science	CO:1 Design mathematical logic with Propositional Calculus and Predicate Calculus.
			CO:2 Assume mathematical principles and logics to solve real time problems.
			CO:3 Apply graph theory for real time problems like network routing problem.

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			CO:4 Examine Principles of Inclusion-Exclusion, Pigeonhole Principle and its Application.
			CO:5 Apply Recurrence Relations by Substitution and Generating Functions.
13	I/II	Software Testing Methodologies	CO: 1 Examine Taxonomy of Bugs, Basics Concepts of Path Testing and theme of testing.
			CO:2 Make use of Transaction and Dataflow Techniques.
			CO:3 Illustrate Domain testing and Interface Testing.
			CO:4 Organize Logic Based Testing, Graph Matrices and apply node reduction algorithm.
			CO:5 Identify the needs of software test automation and develop a test tool to support test automation.
14	I/II	Agile Software Development	CO:1 Summarize the agile methodologies: extreme programming, scrum, and feature driven programming.
			CO:2 Apply The Twelve XP Practices and Illustrate pair programming and its characteristics
			CO:3 Apply XP to a small project.
			CO:4 Examine Feature-Driven Development and Regaining Control
			CO:5 Relate Agile Modeling and RUP and Choose Tools to help with Agile Development
15	I/II	ERP & Supply Chain Management	CO:1 Construct a model to generate forecasts for a company's products
			CO:2 Develop a Business Modules by using fundamentals Supply chain Management.
			CO:3 Apply Supply chain strategies and list the performance Metrics.
			CO:4 Develop an aggregate production plan with relevant deterministic and stochastic inventory models.
			CO:5 Apply cost management strategies and Measure service levels.

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16	I/II	Secure Software Engineering**Drawing**	CO:1 Explain the Properties of Secure Software and Specify Desired Security Properties.
			CO:2 Incorporate requirements into secured software development process.
			CO:3 Apply secure design principles for developing attack resistant software
17	I/II	Big Data Analytics	CO:1 Illustrate on big data and its use cases from selected business domains.
			CO:2 Interpret and summarize on No SQL, Cassandra
			CO:3 Analyze the HADOOP and Map Reduce technologies associated with big data analytics and explore on Big Data applications Using Hive.
			CO:4 Make use of Apache Spark, RDDs etc. to work with datasets.
			CO:5 Assess real time processing with Spark Streaming.
18	I/II	Design Patterns	CO:1 Identify the appropriate design patterns to solve object oriented design problems..
			CO:2 Develop design solutions using creational patterns
			CO:3 Apply structural patterns to solve design problems.
			CO:4 Construct design solutions by using behavioural patterns.
			CO:5 Demonstrate about Advanced Patterns like Pattern Catalogs
19	I/II	Software Testing Lab	CO:1 Demonstrate a wide range of techniques including testing, test case coverage determination and Software quality factor.
			CO:2 Choose the existing testing techniques are most effective for vulnerability detection.
			CO:3 Design test planning and Examine the test process
20	I/II	SE LAB-II	CO:1 Creation of SOA compliant web service using various technologies and

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			available to open standards
			CO:2 Creating applications for Big Data analytics
			CO:3 Building a complete business data analytic solution
			CO: 4 Understand how design patterns solve design problems
			CO:5 Develop design solutions using creational patterns, structural and behavioural patterns
21	II/I	Object Oriented Software Engineering	CO:1 Analyze of a formally specified problem statement with Modeling Concepts.
			CO:2 Examine Project Organization, Communication and analysis Concepts.
			CO:3 Produce appropriate System Design, object design of reusable Activities
			CO:4 Apply skills relevant for Mapping Models to Code, Configuration and project Management
			CO: 5 Organize Maturity to Software Life Cycle Models and Methodologies
22	II/I	Artificial Intelligence	CO:1 Formulate an efficient problem space for a problem specification and discuss current trends in AI.
			CO:2 Select a search algorithm for a problem and characterize its time and space complexities.
			CO:3 Experiment with knowledge using the appropriate techniques for Logic concepts
			CO:4 Develop knowledge representation using semantic network, semantic web and List advanced techniques of knowledge representation.
			CO:5 Apply AI techniques to solve problems of Expert Systems
23	II/I	User Interface Design	CO: 1 Analyze a user interface from a communication perspective with graphical user interface
			CO:2 Discuss the nature of the design process..

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			CO3 Select an appropriate interaction design pattern for Screen Designing.
			CO:4 Demonstrate on selection of window and Components..
			CO:5 Select Software tools and list the Interaction Devices
24	**II/I**	Python Programming	CO:1 Understand and comprehend the basics of python programming
			CO:2 Demonstrate the principles of structured programming and be able to describe, design, implement, and test structured programs using currently accepted methodology.
			CO:3 Explain the use of the built-in data structures list, sets, tuples and dictionary.
			CO:4 Identify real-world applications using oops, files and exception handling provided by python.
25	**II/I**	Machine Learning	CO:1 Domain Knowledge for Productive use of Machine Learning and Diversity of Data.
			CO:2 Demonstrate on Supervised and Computational Learning
			CO:3 Analyze on Statistics in learning techniques and Logistic Regression CO:4 Illustrate on Support Vector Machines and Perceptron Algorithm
			CO:5 Design a Multilayer Perceptron Networks and classification of decision tree
26	**II/I**	Deep Learning	CO:1 Demonstrate the basic concepts fundamental learning techniques and layers.
			CO:2 Discuss the Neural Network training, various random models.

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			CO:3 Explain different types of deep learning network models.
			CO:4 Classify the Probabilistic Neural Networks.
			CO:5 Apply Deep Learning tools and techniques for various applications..

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Master of Computer Applications Course Outcomes

For the Academic Year 2023-2024

Master of Computer Applications I&II Sem Course Outcomes for the Academic Year			
S.No.	**Year/Sem**	**Course Name**	**Course Outcomes**
1	I/I	**Business Communication**	**CO1:** Discuss the shift from paper to digital communication.
			CO2: Compose emails and memos intended for an audience within the same company or team as the writer.
			CO3: Identify other common methods of professional communication.
2	I/I	**Mathematical and Statistical Foundations**	**CO1:** Apply the basic rules and theorems of probability theory such as Baye's Theorem, determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution
			CO2: Able to perform and analyze of sampling, means, proportions, variances and estimates the maximum likelihood based on population parameters.
			CO3: Learn how to formulate and test hypotheses about sample means, variances, and proportions and to draw conclusions based on the results of statistical tests.
			CO4: Design various ciphers using number theory.
			CO5: Apply graph theory for real time problems like network routing problem.
3	I/I	**Computer Organization & Operating Systems**	**CO1:** Understand the basic organization of computer and different instruction formats and addressing modes
			CO2: Analyze the concept of pipelining, segment registers and pin diagram of CPU.
			CO3: Understand and analyze various issues related to memory

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			hierarchy
			CO4: Evaluate various modes of data transfer between CPU and I/O devices
			CO5: Examine various inter connection structures of multi processors
4	I/I	**Data Structures**	**CO1:** Implement basic programs by using C concepts.
			CO2: Select the data structures that efficiently model the information in a problem
			CO3: Assess efficiency trade-offs among different data structure implementations or combinations
			CO4: Implement and know the application of algorithms for sorting and pattern matching.
5	I/I	**Object Oriented Programming with JAVA**	**CO1:** Describe the uses OOP concepts
			CO2: Apply OOP concepts to solve real world problems
			CO3: Distinguish the concept of packages and interfaces
			CO4: Demonstrate the exception handing, multithread applications with synchronization
			CO5: Design the GUI based applications using AWT and Swings
			CO6: Discuss the Collection Framework
6	I/I	**Operating Systems and Linux Lab**	**CO1:** Implement various CPU scheduling algorithms and compare results
			CO2: Implement various disk scheduling algorithms and compare results
			CO3: Implement page replace algorithms
			CO4: Implement various memory management techniques
			CO5: Execute basic Linux commands
7	I/I	**Data Structures Lab**	**CO1:** Implement various basic data structures and its operations.
			CO2: Apply sorting and searching algorithms to given numbers

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			CO3: Implement various tree operations.
			CO4: Implement various graphs algorithms.
			CO5: Develop applications using various data structures.
8	I/I	JAVA Programming Lab	CO1: Apply OOP concepts to solve real world problems
			CO2: Implement different forms of inheritance
			CO3: Create packages and to reuse them.
			CO4: Implement multi threaded programs using synchronization concepts
			CO5: Create user defined exceptions
			CO6: Design GUI applications using AWT and SWINGS.
9	I/I	Socially Relevant Project using Design Thinking	CO1: Design thinking is a human-centered approach to innovation that draws from the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success."
10	I/II	Database Management Systems	CO1: Illustrate the concept of databases, database management systems, database languages, database structures and their work
			CO2: Apply ER modeling and Relational modeling for designing simple databases.
			CO3: Summarize the concepts related to relational model and SQL and Write database queries using relational algebra and structured query language.
			CO4: Design and develop databases from the real world by applying the concepts of Normalization.
			CO5: Outline the issues associated with Transaction Management and Recovery, Tree Structured and Hash-Based Indexing
11	I/II	Computer Networks	CO1: Explain the network architecture, TCP/IP and OSI reference models
			CO2: Identify and understand various techniques and modes of transmission
			CO3: Demonstrate the data link protocols, multi-channel access

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			protocols and IEEE 802 standards for LAN
			CO4: Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme
			CO5: Discuss the elements and protocols of transport layer
			CO6: Develop network security and define various protocols such as FTP, HTTP, Telnet, DNS
12	I/II	**Software Engineering and Design Patterns**	**CO1:** Define various software application domains and remember different process model used in software development.
			CO2: Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques
			CO3: Convert the requirements model into the design model and demonstrate use of software and user interface design principles.
			CO4: Illustrate the appropriate design patterns to solve object-oriented design problems.
			CO5: Apply structural patterns to solve design problems
			CO6: Evaluate the design solutions by using behavioral patterns.
13	I/II	**Data Warehousing and Mining**	**CO1:** Understand the basics of types of data, quality of data, suitable techniques required for preprocessing and measures required to perform data analysis
			CO2: Describe the need of classification, identify suitable technique(s) to perform classification, model building and evaluation
			CO3: Identify the requirements and usage of association rule mining on categorical and continuous data.
			CO4: Compare and identify suitable clustering algorithm(s) (apply with open-source tools), interpret, evaluate and report the result
			CO5: Describe the requirements and the need of web mining
14	I/II	**Mobile Application**	**CO1:** Install and configure Android application development tools

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		Development	**CO2:** Design and develop user interfaces for the Android platform
			CO3: Save state information across important operating system events
			CO4: Apply Java programming concepts to Android application development
15	I/II	**DBMS Lab**	**CO1:** Utilize SQL to execute queries for creating database and performing data manipulation operations
			CO2: Examine integrity constraints to build efficient databases
			CO3: Apply Queries using Advanced Concepts of SQL
			CO4: Build PL/SQL programs including stored procedures, functions, cursors, and triggers
16	I/II	**Computer Networks Lab**	**CO1:** Understand fundamental underlying principles of computer networking
			CO2: Understand details and functionality of layered network architecture.
			CO3: Apply mathematical foundations to solve computational problems in computer networking
17	I/II	**Software Engineering and Design Patterns Lab**	**CO1:** Understand the architecture, creating it and moving from one to any, different structural patterns.
			CO2: Analyze the architecture and build the system from the components.
			C03: Design creational and structural patterns.
			CO4: Learn about behavioral patterns.
18	I/II	**Employability Skills**	**CO1:** Recite the soft skills
			CO2: Make presentations effectively with appropriate body language
			CO3: Be composed with positive attitude
			CO4: Apply their core competencies to succeed in professional and

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19	II/I	**Machine Learning with Python**	**CO1:** Illustrate and comprehend the basics of Machine Learning with Python
			CO2: Demonstrate the algorithms of Supervised Learning and be able to differentiate linear and logistic regressions
			CO3: Demonstrate the algorithms of Unsupervised Learning and be able to understand the clustering algorithms
			CO4: Evaluate the concepts of binning, pipeline Interfaces with examples
			CO5: Apply the sentiment analysis for various case studies
20	II/I	**Internet of Things**	**CO1:** Explain the definition and usage of the term 'the internet of things' in different contexts
			CO2: Discover the various network protocols used in IoT
			CO3: Define the role of big data, cloud computing and data analytics in a typical IoT system.
			CO4: Compare and contrast the threat environment based on industry and/or device type
			CO5: Design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software
21	II/I	**Web Technologies**	**CO1:** Analyze a web page and identify its elements and attributes.
			CO2: To acquire knowledge of xml fundamentals and usage of xml technology in electronic data interchange
			CO3: Build dynamic web pages using JavaScript (client side programming).
			CO4: To design and develop web-based enterprise systems for the enterprises using technologies like jsp, servlet.
			CO5: Build web applications using PHP

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22	II/I	**Cryptography and Network Security**	**CO1:** Explain Basic Principles, different security threats, countermeasures, foundation course of cryptography mathematics and Symmetric Encryption.
			CO2: Classify the basic principles of Asymmetric key algorithms and operations of asymmetric key cryptography.
			CO3: Design Cryptographic Hash Functions as SHA-3 and Digital Signatures as Elgamal
			CO4: Explain the concept of Revise Key Management and Distribution and User Authentication
			CO5: Determine the knowledge of Network and Internet Security Protocols such as S/MIME
23	II/I	**Software Project Management**	**CO1:** Apply the process to be followed in the software development life-cycle models
			CO2: Apply the concepts of project management & planning
			CO3: Implement the project plans through managing people, communications, and change
			CO4: Implement communication, modeling, and construction & deployment practices in software development
			CO5: Conduct activities necessary to successfully complete and close the Software projects
24	II/I	**Machine Learning with Python Lab**	**CO1:** Implement procedures for the machine learning algorithms
			CO2: Design Python programs for various Learning algorithms
			CO3: Apply appropriate data sets to the Machine Learning algorithms
			CO4: Identify and apply Machine Learning algorithms to solve real world problems
25	II/I	**IoT Lab**	**CO1:**Interpret the impact and challenges posed by IoT networks leading to new architectural models
			CO2: Compare and contrast the deployment of smart objects and the

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technologies to connect them to network.

			CO3:Appraise the role of IoT protocols for efficient network communication.
			CO4:Elaborate the need for Data Analytics and Security in IoT
			CO5:Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.
26	II/I	**Web Technologies Lab**	**CO1**:Create dynamic and interactive web pages using HTML, CSS & Java Script
			CO2:Experiment with Learn and implement XML concepts
			CO3:Develop web applications using PHP
			CO4:Show the Install Tomcat Server and execute client-server programs
			CO5:Implement programs using Ruby programming
27	II/I	**Internship / Industry Oriented Mini Project/ Skill Development Course (Minimum 6-weeks)**	**CO1**:Learn to apply the Technical knowledge in real industrial situations.
			CO2:Expose students to the engineer's responsibilities and ethics.
			C03:Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.
			CO4:Promote academic, professional and/or personal development.
			CO5:Understand the social, economic and administrative considerations that influence the working environment of industrial organizations
28	II/II	**Digital Marketing**	CO1:Explain about web pages with basic HTML5, DHTML tags using CSS and XML, the overview of W3C DOM.
			CO2: Discuss the key elements of a digital Java Scripts.
			CO3: Apply search engine optimization techniques to a website
			CO4: Illustrate how the effectiveness of a digital marketing campaign can be

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			measured
			CO5: Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs

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29	II/II	**Network Programming**	**CO1:** Explain OSI Model and Standard Internet Protocols .
			CO2: How to handle server process termination
			CO3: Acquire the knowledge of Elementary TCP sockets and I/O Multiplexing and socket .
			CO4: Demonstrate the concepts of FIFOs streams messages and Remote logins.

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Master of Business Administration Course Outcomes

For the Academic Year 2023-2024

Master of Computer Applications I&II Sem Course Outcomes for the Academic Year			
S.No.	Year/Sem	Course Name	Course Outcomes
1	I/I	MANAGEMENT AND ORGANIZATION BEHAVIOUR	**CO1:** Discuss the Basic concepts of Management in business Organizations
			CO2: Conduct the seminars and group discussions through PPT and paper presentations.
			CO3: Identify other examples of recent trends of Management in business organizations.
2	I/I	MANAGERIAL ECONOMICS	**CO1:** Apply the basic rules and theorems of Managerial Economics
			CO2: Students will be acquiring minimum awareness of Economy and its alternate factors influencing the organizational goals that are to be useful to manage the economy.
			CO3: Learn how to calculate the Economy by adopting the simple managerial and Economical principles and procedures .
			CO4: Helps to develop the Economical trends In recent era.
			CO5: Apply graph theory for real time to understand the real time market economy
3	I/I	ACCOUNTING FOR MANAGERS	**CO1:** To enumerate the fundamental concepts of managerial accounting appropriate for all organizations
			CO2: Leaners will absorb about basic accounting fundamentals and to prepare Vertical Financial Statements as per Indian Companies Act 2013.
			CO3: To discuss appropriate financial information to make operational decisions.
			CO4: Learners will mature in financial analysis skills and learn to prepare Cash Flow Statement, Estimated Working Capital and Receivables management.

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			CO5: Learners will mature in financial analysis skills and learn to prepare Cash Flow Statement, Estimated Working Capital and Receivables management.
4	I/I	**QUANTITATIVE APTITUDE FOR BUSINESS DECISIONS**	**CO1**. Relate a formal quantitative approach to problem solving and decision making and acquire the knowledge about mean, median, mode and measures of dispersion. 3 45. Outline quantitative models to decision making and problem analysis, and their interpretations in transportation problems and game theory.
			CO2. Apply the concepts of probabilistic distributions in solving problems.
			CO3: Recall the knowledge of hypothesis testing for large and small samples.
			CO4. Extend the ability to solve linear programming problems by graphical and simple methods.
5	I/I	**LEGAL AND BUSINESS ENVIRONMENT**	**CO1** Given the circumstances, the learner will be able to infer legal aspects of doing business &plan business activities. In a given situation, the learner will be able make use of provisions of the Contract Act to evaluate a contract used in commercial practice.
			CO2: In a given situation, learner will be able to distinguish between various types of Companies and explain their comparative advantages and disadvantages. The learner will be able to explain the legal process involved in formation of a company and understand the relationships amongst the various stakeholders of the compa
			CO3: In context of Intellectual Property Rights (IPR) the learner will understand various components of IPR and differentiate between them. The learner can also identify the uses of IPR in business
			CO4: Under the given scenario, the learner will be able to describe various provisions of IT Act and will be able to use various provisions of Consumer Protection Act.
			CO5: A learner will be able to analyze the elements of Social, political, economic environment around a firm.
6	I/I	**BUSSINESS COMMUNICATION AND SOFT SKILS**	**CO1:** Demonstrate the use of basic and advanced business writing skills.
			CO2: Produce clear and concise written business documents.
			CO3: Develop interpersonal communications skills that are required for social

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			CO4: Plan and conduct effective meetings.
			CO5: Employ proper public speaking techniques.
7	I/I	**CROSS CULTURE MANAGEMENT**	**CO1:** Understanding the modern interpretation of the national culture and impact of culture to the major management process
			CO2: Knowledge of the main parameters characterizing the national cultures and the methodology of its measurement
			CO3: Understanding the major peculiarities of the cross-cultural management process and development of the skills based on cross-cultural differences application to the company' management.
			CO4: Developing skills in communication, team-building, motivation leadership and negotiation in multicultural environment
			CO5: Developing skills in communication, team-building, motivation leadership and negotiation in multicultural environment
8	I/I	**INFORMATION TECHNOLOGY LAB**	**CO1:** Gain in depth knowledge about the functioning ofcomputers and its uses for managers
			CO2: Learn to use Internet and its applications
			CO3: Understand and implement Word processing software
			CO4: Learn applications on Spread sheet software
			CO5: Analyze and learn Presentation software
9	I/I	**BUSSINESS COMMUNICATION AND SOFT SKILS LAB**	**CO1** :Understand fundamentals of communication and able to use concept in day to day world
10	I/II	**FINANCIAL MANAGEMENT**	**CO1:** Understand various concepts related to financial management
			CO2: Able to use various tools and techniques in the area of finance
			CO3: Develop analytical skills this which facilitate the decision making in Business situations.

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11	I/II	**HUMAN RESOURSE MANAGEMENT**	**CO1:** Demonstrate the role of HRM in an organization
			CO2: Utilize the knowledge to gain competitive advantage through people
			CO3: Develop and Design HRM system
12	I/II	**MARKETING MANAGEMENT**	**CO1:** Relate Marketing Mix as a framework for Marketing Decision making.
			CO2: Understand the need, importance and process of Marketing Planning and Control.
			CO3: Learn and examine the students to the dynamic nature of Marketing Function.
			CO4: Acquire an understanding of fundamental concepts of Marketing
13	I/II	**OPERATION MANAGEMENT**	**CO1:** Analyze importance of Operations & SCM and how it can provide a competitive advantage in the marketplace
			CO2: Classify the relationship between Operations & SCM and other business functions, such as Marketing, Finance, Accounting, and Human Resources.
			CO3: Experiment with the knowledge of the issues related to designing and managing Operations & SCM and the techniques to do so.
14	I/II	**BUSINESS RESEARCH METHODS**	**CO1:** Knowledge of concept / fundamentals for differenttypes of research.
			CO2: Applying relevant research techniques.
			CO3: Understanding relevant scaling & measurement techniques and should use appropriate sampling techniques
			CO4: Synthesizing different techniques of coding,editing, tabulation and analysis in doing research.
15	I/II	**PROJECT MANAGEMENT**	**CO1:** Following this course, students will be able to describe a project life cycle, and can skillfully map each stage in the cycle
			CO2: Students will identify the resources needed for each stage, including involved stakeholders, tools and supplementary materials
			CO3: Students will describe the time needed to successfully

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			complete a project, considering factors such as task dependencies and task length
			CO4: Students will be able to provide internal stakeholders with information regarding project costs by considering factors such as estimated cost, variances and profits
16	II/I	**STRATAGIC MANAGEMENT** **[COMMON SUBJECT]**	**CO1**: Formulate organizational vision, mission, goals, andvalues.
			CO2: Develop strategies and action plans to achieve anorganization's vision, mission, and goals.
			CO3: Develop powers of managerial judgment, how toassess business risk, and improve ability to make sound decisions and achieve effective outcomes
17	II/I	**OPERATIONS RESEARCH** **[COMMON SUBJECT]**	**CO1**: Solve linear programming problems using appropriate techniques and optimization solvers, interpret the results obtained.
			CO2: Determine optimal strategy for Minimization of Cost of shipping of products from source to Destination/ Maximization of profits of shipping products using various methods, Finding initial basic feasible and optimal solution of the Transportation problems
			C03: Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.
			CO4: Model competitive real-world phenomena using concepts from game theory. Analyse pure and mixed strategy games
18	II/I	**LEADERSHIP AND CHANGE MANAGEMENT**	**CO1:** Critically analyse leadership and change management theory and principles.
			CO2: Evaluate and apply an integrated leadership and change management approach.
			CO3: Appraise how principle elements of leadership impact on self, employees, organisations, and society.
19	II/I	**PERFORMANCE EVALUATION AND COMPAENSATION**	Acquaint with perspective of different facets of management of an enterprise
			CO2: Understand inputs with reference to the Investment and take

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		MANAGEMENT	decisions along with the techniques for those dicision.
			CO3: Evaluate parameters of enterprise in terms of expenses, control systems and pricing
			CO4: Summarize concept of auditing and its applicability as performance management tool
			CO5: Develop proficiency in driving a practical view of the performance management, advise improvements and provide means to recognize the next levels of initiatives for improving performance,
20	II/I	**HUMAN RESEARCH METRICS AND ANALYSIS**	**CO1:** Relate the importance of using data-based reasoning to support HR decisions.
			CO2: Calculate absenteeism costs, turnover costs, and return-on-investment.
			CO3: Develop recommendations for workforce planning (e.g., staffing needs) based on the results of analysis
			CO4: Develop effective surveys for use in an organizational setting.
			CO5: Translate research findings into practical conclusions and recommendation
21	II/I	**HUMAN CAPITAL MANAGEMENT**	**CO1:** Understand the basics of Human Resource Management
			CO2: Learn the global Human Resource practices
			CO3: Learn the global Human Resource practices
			CO4: Learn the learning and development strategies
			CO5: Learn the HR Information Systems and the tools used
22	II/I	**EMESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT**	**CO1:** The student will be able to apply concept oftime value of money in computing the value of fixed income securities. The student will also be able to understand the relationship between interest rates, yield and bond prices.
			CO2: The student will be able to compute and compare the value of a company's equity share with other company's equity by using various methods and tools of equity valuation .

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			CO3: The student will be able to build and evaluate the relationship between the concept of risk and return and will be able to relate its implication on creating portfolio.
			CO4: The student will be able to learn the theoretical concepts of underlying the portfolio creation
			CO5: The student will be able to assess the tools and strategies for portfolio creation and evaluation and will also be able to evaluate the portfolios of mutual funds by using the tools of portfolio evaluation
23	II/I	**MANAGING BANKS AND FINANCIAL INISTITUTIONS**	**CO1:** To develop an understanding of the concepts of scheduled and non-scheduled banks, structure of banking system in India, Narasimham committee and strength, weakness, opportunity and threats of Indian commercial banks.
			CO2: To enable learners to understand about structure and regulation of the financial services industry, Banking norms, NPA, E-Banking, CAR and functions and framework of NBFC.
			CO3: To incorporate the understanding of financial market: Primary market, Secondary capital market, its recent development and Indian money market along with its instruments and intermediaries.
			CO4: It includes Mutual funds, UTI, RBI, SEBI, their functions and objectives. It also includes credit rating, leasing, hire purchase, factoring, venture capital and merchant banking.
24	II/I	**FINANCIAL MARKETS AND SERVIES**	**CO1:** On successful completion of the course students will be able to:
			CO2: Understand the role and importance of the Indian financial market
			CO3: Apply and analyse the Concepts relevant to Indian financial markets and financial institutions
			CO4: Understand and analyse the mechanics and regulation of financial

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			instruments and determine how the value of stocks, bonds, and securities are calculated.
25	II/I	**MERGERS ACQUISITIONS AND CORPORATE RESTRUCTURING**	**CO1**:Understanding of different types of mergers and acquisitions and the process involved in executing their deals.
			CO2:Develop an ability to understand factors influencing the valuation of a business and different methods used in Business Valuation.
			CO3:Basic understanding about regulatory environment of mergers and acquisitions in India..
			CO4:Analyze investment opportunities in fixed income securities.
			CO5:Assess various case studies to analyze valuation strategies, pre and post merger issues and challenges.
26	II/I	**CONSUMER BEHAVIOUR**	**CO1**: Upon successful completion of this course, students will have acquired experience in:
			CO2: preparation for and participation in classroom discussion;
			CO3: group project management; preparation of written reports that demonstrate professionalism and proficiency in communication;
27	II/I	**RETAIL MANAGEMENT**	**CO1**:Clarify the concept and related terms in retailing.
			CO2:Comprehend the ways retailers use marketing tools and techniques to interact with their customers.
			C03:Understand various formats of retail in the industry
			CO4:Recognize and understand the operations-oriented policies, methods, and procedures used by successful retailers today's global economy.
	II/I	**CUSTOMER RELATIONSHIP MANAGEMENT**	CO1: Able to understand and explain Introduction to customer relationship management
			CO2: Understand relationships and identify organizational and customer

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28			relationship management issues, plan and implement customer relationship management projects, and develop, manage and use customer related databases.
			CO3: Able to understand and explain Customer portfolio management, customer relationship and customer experience, create value for customers, manage customer life cycle: customer acquisition, customer retention and development, how to manage network for customer relationship management performance and investor and employee relations, suppliers and partners, and information technology for customer relationship management.
29	II/I	**STRATEGIC MARKETING MANAGEMENT**	**CO1:** Demonstrate a strategic, global and ethically informed understanding of the marketing management process, taking account of established and emerging practices in digital marketing
			CO2: Show critical awareness of the analytical processes used to evaluate market opportunities and propose appropriate marketing strategies to achieve competitive advantage in a variety of global and dynamic market contexts.
			CO3: Understand the activities and organisational structures, including networking and partnerships, required to implement, monitor and measure the performance of marketing strategies .
			CO4: Use evidence-based and data mining techniques to creatively segment and target markets as well as position products/ services against market needs and competitive offerings.

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30	II/II	**SUPPLY CHAIN MANAGEMENT AND ANALYSIS** **[COMMON SUBJECT]**	**CO1**: Develop an understanding of the importance of logistics in the formulation of the business strategy and the conduct of supply chain operations..
			CO2: Develop an in-depth understanding of logistics operating areas and their interrelationship
			C03: Strengthen integrative management analytical and problem-solving skills.
31	II/II	**INNOVATION AND ENTERPRENUERSHIP** **[COMMON SUBJECT]**	CO1: Able to design and implement innovation strategies in organizations, corporate foresight and technology with the aim of detecting sources of competitive advantage for evaluating and selecting R&D proposals..
			CO2: Acquainted with the principles of management multidisciplinary human teams for innovations. .
			CO3: Aware of the innovation systems and public programs underpinning technology cooperation agreements with different actors and know how to use external funds.

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32	II/II	LABOUR WELFARE AND EMPLOYMENT LAWS	CO1: Students should able to elaborate the concept of Industrial Relations
			CO2:The students should able to illustrate the role of trade union in the industrial setup.
			CO3: Students should able to outline the important causes & impact of industrial disputes.
			CO4: Students should able to elaborate Industrial Dispute settlement procedures.
			CO5: Student should be able to summarize the important provisions of Wage Legislations, in reference to Payment of Wages Act 1936, Minimum Wages Act 1948 & Payment of Bonus Act 1965
33	II/II	INTERNATIONAL HRM	CO1: Integrated perspective on role of HRM in modern business. Ability to plan human resources and implement techniques of job design
			CO2: Competency to recruit, train, and appraise the performance of employees
			CO3: Rational design of compensation and salary administration
			CO4: Ability to handle employee issues and evaluate the new trends in HRM
34	II/II	EMPLOYEE RELATION AND ENGAGEMENT	CO1: identify and describe the meaning of employee engagement and its different component
			CO2: appreciate the strategic issues associated with employee engagement
			CO3: describe the changes in systems of employee relations
			CO4: appreciate the impact of structures of management and ownership on employee engagement
			CO5: reflect on the current state of employee engagement in an organisation.

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35	II/II	**HUMAN RESOURSE DEVELOPMENT**	**CO1** Students will be able to gain a broad understanding of various concepts of HRD process. This helps them develop a well-rounded perspective and prepares them to face and handle various future challenges.
			CO2: Overall knowledge of HRD concepts: understanding helps students make and improve their decision making capacity.
			CO3: Seed knowledge in various HR concepts and practices for students so that they can apply their skills in HR, HR planning, HR auditing, HR accounting, HRIS and IHRM.
			CO4: Students can learn how to use HRIS programs for their future requirement
			CO5: Provision of case study practices that are applicable in student's future careers growth.
38	II/II	**FINANCIAL DERIVATIVES**	**CO1:** Demonstrate knowledge of all aspects of derivative market theory and the roles they play in the financial markets
			CO2: Identify how derivative instruments can be used to change or hedge risk and evaluate risks and pay-offs associated with trading such instruments and their implications
			CO3: Understand the basic risk management and trading strategies using futures and options
39	II/II	**GLOBAL FINANCIAL MANAGEMENT**	**CO1:** Identify the operations of the developed global financial markets, the trading of financial instruments, and the role of regulatory bodies
			CO2: Apply competences with financial analytical skills required to evaluate the performance of the firm, including the interpretation of financial data
			CO3: Evaluate the financial instruments used in the equity and debt markets for funding the corporation
40	II/II	**FINANCIAL RISK MANAGEMENT**	**CO1:** Learn and compare the advantages and disadvantages of several methodologies for the measurement of various types of risk, including market, interest rate, credit, operational, liquidity and model risk
			CO2: Integrate the methodologies into an overall framework for enterprise risk management

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S.No	Year/Sem	Course	Course Outcomes
41	II/II	STRATAGIC FINANCIAL MANAGEMENT	CO1: Understand financial strategy and control of a company.
			CO2: Learn the relevance of risk and uncertainty in making strategic decisions. Learn various aspects of capital budgeting.
			CO3: Understand the capital structure, dividend policy, financial distress, restructuring
43	II/II	PROMOTIONAL AND DISTRIBUTION SERVICES MANAGMENT	CO1: Discuss the Basic concepts of Management in business Organizations
			CO2: The strategic skill and competencies needed for achieving sales targets
42	II/II	SERVICES MARKETING	CO3: The ability to avoid common mistakes made by sales professionals and negotiators
			CO3: Analyze, interpret and solve problems in service Recovery
			CO4: Perform lifelong learning and professional development to enrich the services marketing strategies
44	II/II	GREEN MARKETING	CO1: Describe the business case for green marketing
			CO2: Identify the current marketing techniques which communicate

			environmental and socially responsible practices of business
			CO3: Analyse how companies can build a green and socially responsible image of the brand
45	II/II	**ADVERTISING AND BRAND MANAGEMENT**	**CO1:** To understand the nature, role, and importance of brand management and advertising in marketing strategy
			CO2: To understand effective design and implementation of advertising strategies
			CO3: To present a general understanding of content, structure, and appeal of advertisements
			CO4: To understand ethical challenges related to responsible management of advertising and brand strategy

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