COURSE OUTCOMES

Sl. No.	Sem		Subject Name	CO
1		MAT 101	**LINEAR ALGEBRA AND CALCULUS**	1. To Solve and interpret any physical or engineering problems. 2. To parameterize interior regions and solids in two dimensional plane three dimensional space 3. To analyze geometric meaning of partial differentiation and multiple integrals 4. To determine whether or not real series are convergent by comparison with standard series or using different test 5. To apply fourier and taylor series for solve engineering problems with a periodic inputs 6. To apply and interpret vectors in two and three dimensional space algebraically and interpret multiple integrals in vector calculus
2	S1 CSE	CYT 100	**ENGINEERING CHEMISTRY**	1. Apply the Basic concepts of electrochemistry to explore its possible applications in various engineering fields . 2. To realize the spectroscopic techniques and its applications and how they are useful in engineering fields and also how the electrochemical cells are applicable 3. Apply the knowledge of analytical method and electrochemical methods for different engineering fields and also the related to batteries and cells 4. Learn about the basics of stereochemistry of organic compounds and its application. Apply the knowledge of conducting polymer and advanced polymer engineering 5. Study various types of water treatment methods to develop skills for treating waste water and water treatments 6. To improve the ability to problem solving and conduct the experiments related to water and its contents
3		EST 110	**ENGINEERING GRAPHICS**	1. Draw the projection of points and lines located in different quadrants 2. Prepare multiview orthographic projections of objects by visualizing them in different positions 3. Draw sectional views and develop surfaces of a given object 4. Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions. 5. Convert 3D views to orthographic views 6. Obtain multiview projections and solid models of objects using CAD tools
4		EST 120	**BASICS OF CIVILAND MECHANICAL ENGINEERING**	1. Recall the role of Civil Engineers in society and relate the various disciplines of Civil Engineering and explain about the different types of buildings and its components. 2. Explain the different types of building materials used in building construction and describe the importance, objectives and principles of surveying. 3. Explain the method of construction of different components of a building and illustrate about types of masonry and discuss about carious services in building. 4. Analyse thermodynamic cycles and calculate its efficiency. 5. Illustrate working and features of IC Engines. 6. Explain the basic principles of refrigeration and Air Conditioning and describe working of hydraulic machines and power transmission elements.
5		HUT 101	**LIFE SKILL**	1. Define and identify different life skills required in personal and professional life 2. Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress 3. Explain the basic mechanics of effective communication and demonstrate these through presentations 4. Take part in group discussions 5. Use appropriate thinking and problem-solving techniques to solve new problems 6. Understand the basics of teamwork and leadership

8		CYL 120	ENGINEERING CHEMISTRY LAB	1. To realize and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analysis 2. Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs 3. Develop the ability to understand and explain the use of modern spectroscopic techniques for analyzing and interpreting the IR spectra and NMR spectra of some organic compounds 4. Acquire the ability to understand ,explain and use instrumental techniques for chemical analysis 5. Learn to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments 6. Function as a member of a team, communicate effectively and engage in further learning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum
9		ESL 120	CIVIL& MECH WORKSHOP	1. Explain the use of various tools and devices for various field measurements 2. Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work. 3. Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing. 4. Compare different techniques and devices used in civil engineering measurements 5. Identify Basic Mechanical workshop operations in accordance with the material and objects 6. Apply appropriate Tools and Instruments with respect to the mechanical workshop trades
10		MAT 102	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	1. To Solve and interpret any physical or engineering problems 2. Compute the derivatives and line integrals of vector functions and learn their applications 3. Evaluate surface and volume integrals and learn their inter relations and applications 4. Can apply Fourier series to represent and analyze periodic functions Solve homogeneous and non homogeneous linear differential equation with constant coefficients 5. Compute Laplace transforms and apply them to solve ODEs arising in engineering 6. Determine the Fourier transforms of functions and apply them to solve problems arising in engineering
11	S2 CSE	PHT 100	ENGINEERING PHYSICS	1. To interpret principles of physicsand correlate the concepts of Physics with engineering system 2. To differentiate harmonic oscillations and waves and apply the knowledge in mechanical and electrical systems 3. To illustrate the interaction of light with matter through interference and diffraction 4. Analyze the behavior of matter in the atomic and subatomic level through the principles of quantum mechanics and nanotechnology . 5. To illustrate the nature and characterization of acoustic design and ultrasonic testing tools using principle of acoustics and ultra sonics 6. To apply the principles of laser, holography and fibre optic communication systems in various engineering applications
12		EST 100	ENGINEERING MECHANICS	1. To understand distributed force systems, centroid/ center of gravity and method of finding centroids of composite figures and bodies 2. To understand the moment of inertia and method of finding moment of inertia of areas and bodies. 3. To understand types of frames and analyze for the forces in the members

				of the truss by method of joints and method of sections 4. To understand dynamics of a particle. 5. To interpret the simple given dynamic problems and solve them for positions, velocities and accelerations, etc., 6. To understand the kinetics of the rigid bodies and solve simple problems using work-energy method
13		EST 130	**BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING**	1. Apply fundamental concepts and circuit laws to solve simple DC electric circuits 2. Develop and solve models of magnetic circuits 3. Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state 4. Describe working of a voltage amplifier 5. Outline the principle of an electronic instrumentation system 6. Explain the principle of radio and cellular communication
15		EST 102	**PROGRAMMING IN C**	1. Analyze a computational problem and develop an algorithm/flowchart to find its solution 2. Develop readable C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators. 3. Write readable C programs with arrays, structure or union for storing the data to be processed 4. Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem 5. Write readable C programs which use pointers for array processing and parameter passing 6. Develop readable C programs with files for reading input and storing output
16		HUT 102	**PROFESSIONAL COMMUNICATION**	1. Develop vocabulary and language skills relevant to engineering as a profession 2. Analyze, interpret and effectively summarize a variety of textual content 3. Create effective technical presentations 4. Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus 5. Identify drawbacks in listening patterns and apply listening techniques for specific needs 6. Create professional and technical documents that are clear and adhering to all the necessary conventions
17		PHL 120	**ENGINEERING PHYSICS LAB**	1. Apply modern instruments like CRO, strain gauge to measure the basic physical quantities viz. frequency and amplitude of a wave pattern, strain etc. 2. Carryout measurement of wave pattern in a stretched string and the corresponding frequency values using a Melde's string apparatus. 3. Determine the wavelength of monochromatic beam of light and thickness of micro-thin object etc. by forming Newton's rings pattern and an air wedge fringe pattern. 4. Carryout the measurement of wavelength by diffraction of plane transmission grating and the spectra formed by a monochromatic beam of light and a laser. 5. Determine the wavelength of a laser using plane transmission grating 6. Measurement of numerical aperture of an optic fibre and evaluate the properties of a solar cell and LED through its I-V characteristics
18		ESL 130	**ELECTRICAL & ELECTRONICS WORKSHOP**	1. Demonstrate safety measures against electric shocks. 2. Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols 3. Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings 4. Identify and test various electronic components

				5. Draw circuit schematics with EDA tools 6. Assemble and test electronic circuits on boards
19		MAT 203	DISCRETE MATHEMATICAL STRUCTURES	1. Relate each major topic in discrete mathematics to an application area in computing 2. To verify the validity of an argument using propositional and predicate logic 3. To identify and apply operations on discrete structures such as sets, relations and functions in different areas of computing 4. To recognize relationship between sequences and recurrence relation 5. Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science 6. Construct the idea of discrete mathematics through concept from abstract algebra
20	S3 CSE	CST 201	DATA STRUCTURES	1. Design an algorithm for a computational task and calculate the time/space complexities of that algorithm 2. Identify the suitable data structure (array or linked list) to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem 3. Write an algorithm to find the solution of a computational problem by selecting an appropriate data structure (binary tree/graph) to represent a data item to be processed 4. Store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set 5. Select appropriate sorting algorithms to be used in specific circumstances 6. Design and implement Data Structures for solving real world problems efficiently
21		CST 203	LOGIC SYSTEM DESIGN	1. Students will be able to convert one number system to an another one and to apply arithmetic operations on different number systems 2. Students will be able to apply the basic concepts of Boolean algebra for the simplification and implementation of logic functions using suitable gates namely NAND, NOR etc. 3. Students will be able to design simple Combinational Circuits such as Adders, Subtractors, Code Convertors, Decoders, Multiplexers, Magnitude Comparators etc. 4. Students will be able to understand about flip flop and latches, also will be able to design state diagrams with state equations 5. Students will be able to design Sequential Circuits such as different types of Counters, Shift Registers, Serial Adders, and Sequence Generators. 6. Students will be able to use Hardware Description Language for describing simple logic circuits and able to apply algorithms for addition/subtraction operations on Binary, BCD and Floating Point Numbers.
22		CST 205	OBJECT ORIENTED PROGRAMMING USING JAVA	1. Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism 2. Utilise datatypes, operators, control statements, built in packages & interfaces, Input/Output Streams and Files in Java to develop programs 3. Illustrate how robust programs can be written in Java using exception handling mechanism 4. Write application programs in Java using multithreading and database connectivity 5. Write Graphical User Interface based application programs by utilising event handling features and Swing in 6. JavaUse an integrated development environment to write, compile, run and test simple object oriented Java programs

23		HUT 200	**PROFESSIONAL ETHICS**	1. Understand the core values that shape the ethical behaviour of a professional 2. Adopt a good character and follow an ethical life 3. Explain the role and responsibility in technological development by keeping personal ethics and legal ethics 4. Solve moral and ethical problems through exploration and assessment by established experiments. 5. Apply the knowledge of human values and social values to contemporary ethical values and global issues. 6. The students develop/ propose appropriate technologies and management patterns to create harmony in professional and personal life.
24		MNC 201	**SUSTAINABLE ENGINEERING**	1. Understand the relevance and concept of sustainability, sustainable development and global initiatives in this regard andapplying the same in day to day activities. 2. Evaluating the different types of environmental pollution problems and their sustainable solutions. 3. Discuss the different environmental regulations and standards. 4. Outline the concepts related to conventional and non-conventional energy and bring necessary awareness in resource utilization. 5. Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles. 6. Analyzing the relation between technology and sustainable development and able to attain a balance between both.
25		CSL 201	**DATA STRUCTURES LAB**	1. Write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements 2. Write a time/space efficient program to sort a list of records based on a given key in the record 3. Examine a given Data Structure to determine its space complexity and time complexities of operations on it 4. Design and implement an efficient data structure to represent given data 5. Write a time/space efficient program to convert an arithmetic expression from one notation to another 6. Write a program using linked lists to simulate Memory Allocation and Garbage Collection
26		CSL 203	**OBJECT ORIENTED PROGRAMMING LAB**	1. Implement the Object Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java (Cognitive Knowledge Level: Apply) 2. Implement programs in Java which use datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and Files (Cognitive Knowledge Level: Apply) 3. Implement robust application programs in Java using exception handling (Cognitive Knowledge Level: Apply) 4. Implement application programs in Java using multithreading and database connectivity (Cognitive Knowledge Level: Apply) 5. Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java (Cognitive Knowledge Level: Apply) 6. Implement java database connectivity using Graphical User Interface based application programs for creating .exe installation type files (Cognitive Knowledge Level: Apply)
28	S4 CSE	MAT 206	**GRAPH THEORY**	1. Explain vertices and their properties, types of paths, classification of graphs and trees & their properties 2. Demonstrate the fundamental theorem on Eulerian and Hamiltonian graphs. . 3. Illustrate the working of Prim's and Kruskal's algorithm for finding minimum cost spanning tree and Dijkstra's and Floyd-Warshal algorithm for finding shortest path. .

				4. Explain planar graph, their properties and an application for planar graphs 5. Illustrate how one can represent a graph in a computer 6. Explain the vertex color problem in graphs and illustrate an example application for vertex coloring
29		CST 202	**COMPUTER ORGANISATION & ARCHITECTURE**	1. .Recognize and express the relevance of basic components and demonstrate control signal required for execution of a given instruction 2. Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it 3. Explain the implementation aspects of arithmetic algorithms and pipelining schemes in a digital computer 4. Develop the control logic for a given arithmetic problem 5. Explain the types of memory systems, , I/O organization and mapping functions used in memory system
30		CST 204	**DATABASE MANAGEMENT SYSTEMS**	1. Summarize and exemplify fundamental nature and characteristics of database systems. 2. Model real word scenarios given as informal descriptions, using Entity Relationship diagrams. 3. Model and design solutions for efficiently representing and querying data using relational model. 4. Demonstrate the features of indexing and hashing in database applications 5. Discuss and compare the aspects of Concurrency Control and Recovery in Database systems . 6. Explain various types of NoSQL databases .
31		CST 206	**OPERATING SYSTEMS**	1. Explain the relevance, structure and functions of Operating Systems in computing devices. 2. Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems. 3. Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors 4. Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems. 5. Explain the memory management algorithms in Operating Systems. 6. Explain the security aspects and algorithms for file and storage management in Operating Systems.
32		EST 200	**DESIGN & ENGINEERING**	1. Appreciate the different concepts and principles involved in design 2. Apply design thinking while learning and practicing engineering 3. Develop innovative, reliable, sustainable and economically viable designs incorporating different segments of knowledge in engineering. 4. How designs are varied based on the aspects of production methods, life span, reliability and environment 5. How concepts like value engineering , concurrent engineering and reverse engineering influence engineering designs 6. The role of divergent-convergent questioning in design thinking
33		MNC 202	**CONSTITUTION OF INDIA**	1. To explain the background of the present constitution of India and features. 2. To utilize the fundamental rights and duties 3. To understand the working of the union executive legislature and judiciary. 4. To utilize the special provisions and statutory institutions. 5. To Show national and patriotic spirit 6. To Understand the importance of constitution
34		CSL 202	**DIGITAL LAB**	1. Realize the functions of basic and universal gates in SOP and POS forms 2. Design and implement combinational logic circuits using Logic Gates (Cognitive Knowledge 3. Design and implement sequential logic circuits using Integrated Circuits 4. Simulate functioning of digital circuits using programs written in a Hardware Description Language

				5. Function effectively as an individual and in a team to accomplish a given task of designing and implementing digital circuits
35		**CSL 204**	**OPERATING SYSTEMS LAB**	1. Illustrate the use of systems calls in Operating Systems. 2. Implement Process Creation and Inter Process Communication in Operating Systems. 3. Implement Fist Come First Served, Shortest Job First, Round Robin and Prioritybased CPU Scheduling Algorithms. 4. Illustrate the performance of First In First Out, Least Recently Used and Least Frequently Used Page Replacement Algorithms. 5. Implement modules for Deadlock Detection and Deadlock Avoidance in Operating Systems. 6. Implement modules for Storage Management and Disk Scheduling in Operating Systems.
36		**ECT 282**	**MICROCONTROLLERS**	1. Explain the building blocks of typical microcomputer or microcontroller system 2. Familiarize the instruction set of 8051 and perform assembly language programming 3. Interface the various peripheral devices to the microcontroller using assembly/C programming 4. Realize external communication interface to the microcontroller 5. familiarize the building blocks of RISC processors and ARM microcontrollers
37		**CST301**	**Formal Languages and Automata Theory**	1. Explain a formal representation of a given regular language as a finite state automaton 2. Explain a formal representation of a regular grammar, regular expression and explain homomorphism and ultimate periodicity, DFA minimization 3. Explain Myhill-Nerod relation .and Context-Free Grammar for a given context-free language 4. Design a Pushdown Automaton, properties of context- free languages 5. Design Turing machines as language acceptors or transducers, Explain the notion of decidability, Classify a given formal language into Regular, Context-Free, Context sensitive, Recursive or Recursively Enumerable.
38	**S5 CSE**	**CST303**	**Computer Networks**	1. Explain the features of computer networks, protocols, and network design models 2. Describe the fundamental characteristics of the physical layer and identify the usage in network communication 3. Explain the design issues of data link layer, link layer protocols, bridges and switches 4. Illustrate wired LAN protocols (IEEE 802.3) and wireless LAN protocols (IEEE 802.11) 5. Select appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for a network 6. Illustrate the functions and protocols of the network layer, transport layer, and application layer in inter-networking
39		**CST305**	**System Software**	1. Distinguish softwares into system and application software categories 2. Identify standard and extended architectural features of machines. 3. Identify machine dependent features of system software 4. Identify machine independent features of system software. 5. Design algorithms for system softwares and analyze the effect of data structures. 6. Understand the features of device drivers and editing & debugging tools
40		**CST307**	**Microprocessors and Microcontrollers**	1. Illustrate the architecture, modes of operation and addressing modes of microprocessors 2. Develop 8086 assembly language programs. 3. Demonstrate interrupts, its handling and programming in 8086 4. Illustrate how different peripherals (8255,8254,8257) and memory are interfaced with microprocessors.

				5. Outline features of microcontrollers and develop low level programs.
41		CST309	**Management of Software Systems**	1. Demonstrate Traditional and Agile Software Development approaches 2. Prepare Software Requirement Specification and Software Design for a given problem. 3. Justify the significance of design patterns and licensing terms in software development, prepare testing, maintenance and DevOps strategies for a project. 4. Make use of software project management concepts while planning, estimation, scheduling, tracking and change management of a project, with a traditional/agile framework. 5. Utilize SQA practices, Process Improvement techniques and Technology advancements in cloud based software models and containers & microservices.
42		MCN 301	**Disaster Management**	1. Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle 2. Distinguish between different hazard types and vulnerability types and do vulnerability assessment 3. Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk 4. Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community 5. Identify factors that determine the nature of disaster response and discuss the various disaster response actions 6. Explain the various legislations and best practices for disaster management and risk reduction at national and international level
43		CST395	**Neural Networks & Deep Learning**	1. Demonstrate the basic concepts of machine learning models and performance measures. 2. Illustrate the basic concepts of neural networks and its practical issues 3. Outline the standard regularization and optimization techniques for deep neural networks 4. Build CNN and RNN models for different use cases. 5. Explain the concepts of modern RNNs like LSTM, GRU
44				6.
45		CSL331	**System Software and Micrprocessors Lab**	1. Develop 8086 programs and execute it using a microprocessor kit. 2. Develop 8086 programs and, debug and execute it using MASM assemblers 3. Develop and execute programs to interface stepper motor, 8255, 8279 and digital to analog converters with 8086 trainer kit 4. Implement and execute different scheduling and paging algorithms in OS 5. Design and implement assemblers, Loaders and macroprocessors.
		CSL333	**Database Management Syastems Lab**	1. Design database schema for a given real world problem-domain using standard design and modeling approaches. 2. Construct queries using SQL for database creation, interaction, modification, and updation. 3. Design and implement triggers and cursors. 4. Implement procedures, functions, and control structures using PL/SQL. 5. Perform CRUD operations in NoSQL Databases. 6. Develop database applications using front-end tools and back-end DBMS.
55	S6 CSE	CST 302	**Compiler Design**	1. Explain the phases in compilation process(lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimization and code generation) and model a lexical analyzer 2. Model language syntax using Context Free Grammar and develop parse tree representation using leftmost and rightmost derivations

				3. Compare different types of parsers(Bottom-up and Top-down) and construct parser for a given grammar
				4. Build Syntax Directed Translation for a context free grammar, compare various storage allocation strategies and classify intermediate representations
				5. Illustrate code optimization and code generation techniques in compilation
56		CST 304	**Computer Graphics and Image Processing**	1. Describe the working principles of graphics devices
				2. Illustrate line drawing, circle drawing and polygon filling algorithms
				3. Demonstrate geometric representations, transformations on 2D & 3D objects, clipping algorithms and projection algorithms
				4. Summarize visible surface detection methods
				5. Summarize the concepts of digital image representation, processing and demonstrate pixel relationships
				6. Solve image enhancement and segmentation problems using spatial domain techniques
57		CST 306	**Algorithm Analysis and Design**	1. Analyze any given algorithm and express its time and space complexities in asymptotic notations.
				2. Derive recurrence equations and solve it using Iteration, Recurrence Tree, Substitution and Master's Method to compute time complexity of algorithms
				3. Illustrate Graph traversal algorithms & applications and Advanced Data structures like AVL trees and Disjoint set operations.
				4. Demonstrate Divide-and-conquer, Greedy Strategy, Dynamic programming, Branch-and Bound and Backtracking algorithm design techniques
				5. Classify a problem as computationally tractable or intractable, and discuss strategies to address intractability
				6. Identify the suitable design strategy to solve a given problem.
58		CST322	**Data Analytics**	1. Illustrate the mathematical concepts for data analytics
				2. Explain the basic concepts of data analytics
				3. Illustrate various predictive and descriptive analytics algorithms
				4. Describe the key concepts and applications of Big Data Analytics
				5. Demonstrate the usage of Map Reduce paradigm for Big Data Analytics
				6. Use R programming tool to perform data analysis and visualization
59		CST362	**Programming in Python**	1. Write, test and debug Python programs
				2. Illustrate uses of conditional (if, if-else and if-elif-else) and iterative (while and for) statements in Python programs
				3. Develop programs by utilizing the Python programming constructs such as Lists, Tuples, Sets and Dictionaries
				4. Develop graphical user interface for solutions using Python libraries.
				5. Implement Object Oriented programs with exception handling.
				6. Write programs in Python to process data stored in files by utilizing Numpy, Matplotlib, and Pandas.
60		HUT300	**Industrial Economics & foreign Trade**	1. Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare
				2. Take appropriate decisions regarding volume of output and to evaluate the social cost of production.
				3. Determine the functional requirement of a firm under various competitive conditions
				4. Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society.
				5. Determine the impact of changes in global economic policies on the business opportunities of a firm.
61		CST308	**Comprehensive Course Work**	1. Comprehend the concepts of discrete mathematical structures
				2. Comprehend the concepts and applications of data structures
				3. Comprehend the concepts, functions and algorithms in Operating System
				4. Comprehend the organization and architecture of computer systems

				5. Comprehend the fundamental principles of database design and manipulation
				6. Comprehend the concepts in formal languages and automata theory
62		CSL 332	**Networking Lab**	1. Use network related commands and configuration files in Linux Operating System
				2. Develop network application programs and protocols
				3. Analyze network traffic using network monitoring tools.
				4. (
				5. Design and setup a network and configure different network protocols
				6. Develop simulation of fundamental network concepts using a network simulator.
63		CSD 334	**Mini Project**	1. Identify technically and economically feasible problems
				2. Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes
				3. Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques
				4. Prepare technical report and deliver presentation
				5. Apply engineering and management principles to achieve the goal of the project
73		CS401	**COMPUTER GRAPHICS**	1. Compare various graphics devices
				2. Analyze and implement algorithms for line drawing, circle drawing and polygon filling
				3. Apply geometrical transformation and various projection techniques on 2D and 3D objects
				4. Analyze and implement algorithms for clipping
				5. Summarize visible surface detection methods
				6. Interpret various concepts and basic operations of image processing
74		CS403	**PROGRAMMING PARADIGMS**	1. Compare scope & binding of names and analyze control flow structures in different programming languages.
				2. Appraise data types in different programming languages
				3. Analyze and describe different control abstraction mechanisms
				4. Appraise constructs in functional, logic and scripting languages
				5. Analyze object oriented constructs in different programming languages
				6. Compare different concurrency constructs and interpret the concepts of run-time program management.
75	S7 CSE	CS405	**COMPUTER SYSTEM ARCHITECTURE**	1. Summarize different parallel computer models.
				2. Analyze the advanced processor technologies and interpret memory hierarchy Analyze and describe different control abstraction mechanisms
				3. Compare different multiprocessor system interconnecting mechanisms and interpret the mechanisms for enforcing cache programming languages
				4. Analyze different message passing mechanisms
				5. Analyze different pipe lining techniques
				6. Appraise concepts of multithreaded and data flow architectures
76		CS407	**DISTRIBUTED COMPUTING**	1. To design and distinguish distributed computing paradigm from other computing paradigms
				2. To identify the core concepts of distributed systems
				3. To illustrate the mechanisms of inter process communication in distributed system
				4. To apply appropriate distributed system principles in ensuring transparency, consistency and fault-tolerance in distributed file system
				5. To compare the concurrency control mechanisms in distributed transactional environment
				6. To outline the need for mutual exclusion and election algorithms in distributed systems
77		CS409	**CRYPTOGRAPHY & NETWORK SECURITY**	1. Summarize different classical encryption techniques
				2. Identify mathematical concepts for different cryptographic algorithms
				3. Demonstrate cryptographic algorithms for encryption/key exchange

No	Sem	Code	Course	Course Outcomes
				4. Summarize different authentication and digital signature schemes
				5. Identify security issues in network, transport and application layers and outline appropriate security protocols.
				6. Implement the fundamentals of secret and public cryptography.
78		CS463	**Digital Image Processing**	1. compare different methods for image acquisition, storage and representation in digital devices and computers
				2. Appreciate role of image transforms in representing, highlighting, and modifying image features
				3. Interpret the mathematical principles in digital image enhancement and apply them in spatial domain and frequency domain
				4. Apply various methods for segmenting image and identifying image component
				5. Summaries different reshaping operations on the image and their practical applications
				6. Identify image representation techniques that enable encoding and decoding images
79		CS467	**MACHINE LEARNING**	1. Differentiate various learning approaches, and to interpret the concepts of supervised learning
				2. Compare the different dimensionality reduction techniques.
				3. Apply theoretical foundations of decision trees to identify best split and Bayesian classifier to label data points
				4. Illustrate the working of classifier models like SVM, Neural Networks and identify classifier model for typical machine learning applications
				5. Identify the state sequence and evaluate a sequence emission probability from a given HMM
				6. Illustrate and apply clustering algorithms and identify its applicability in real life problems
80		CS451	**SEMINAR & PROJECT PRELIMINARY**	1. To analysis a current topic of professional interest and present it before an audience
				2. To Identify an engineering problem, analyse it and propose a work plan to solve it
				3. To effectively gather and interpret information from literature survey.
				4. To use information from literature survey to identify, formulate, analyze and solve complex problems and to evaluate and interpret various solutions.
				5. To Gain the ability to communicate effectively with written, oral, and visual means in a technical setting.
				6. To carry out calculations involved in design, consider and evaluate alternate assumptions, approaches, and procedures.
81		CS431	**COMPILER DESIGN LAB**	1. Students will be able to implement the techniques of Lexical Analysis and Syntax Analysis
				2. Students will be able to apply the knowledge of Lex&Yacc tools to develop programs
				3. Students will be able to generate NFA and DFA
				4. Students will be able to develop different parsers.
				5. Students will be able to generate intermediate code.
				6. Students will be able to implement Optimization techniques and generate machine level code
82	S8 CSE	CS402	**DATA MINING AND WARE HOUSING**	1. Identify the key process of Data mining and Warehousing
				2. Apply appropriate techniques to convert raw data into suitable format for practical data mining tasks
				3. Analyze and compare various classification algorithms and apply in appropriate domain
				4. Evaluate the performance of various classification methods using performance metrics
				5. Make use of the concept of association rule mining in real world scenario
				6. Select appropriate clustering and algorithms for various applications,

				extend data mining methods to the new domains of data
83		CS404	**EMBEDDED SYSTEMS**	1. Demonstrate the role of individual components involved in a typical embedded system 2. Analyze the characteristics of different computing elements and select the most appropriate one for an embedded system 3. Model the operation of a given embedded system 4. Substantiate the role of different software modules in the development of an embedded system 5. Develop simple tasks to run on an RTOS 6. Examine the latest trends prevalent in embedded system design
84		CS464	**ARTIFICIAL INTELLIGENCE**	1. Describe the scope and limits of the artificial intelligence (AI) field. 2. Understand different types of AI agents. 3. Explain various search algorithms (uninformed, informed, and heuristic) for problem solving. 4. Compare mini-max search and alpha-beta pruning in game playing. **5.** Model complex real world problems using different AI approaches (e.g. as a search problem, as constraint satisfaction problem, as a planning problem.) **6.** Comprehend the fundamentals of Robotics.
85		CS472	**PRINCIPLES OF INFORMATION SECURITY**	1. Appreciate the common threats faced today 2. Interpret the foundational theory behind information security. 3. Design a secure system. 4. Identify the potential vulnerabilities in software. 5. Appreciate the relevance of security in various domains. 6. Develop secure web services and perform secure e-transactions□
86		BT362	**SUSTAINABLE ENERGY PROCESS**	1. Identify global and Indian energy sources. 2. Explain capture, conversion and application of solar 3. Explain capture, conversion and application of wind energy. 4. Explain conversion of biomass to energy. 5. Explain the capture of energy from oceans. 6. Explain fuel cells and energy storage routes.
87		CE482	**ENVIRNMENTAL IMPACT ASSESSMENT**	1. To appreciate the need for minimizing the environmental impacts of developmental activities 2. To understand environmental legislation & clearance procedure in the country 3. To apply various methodologies for assessing the environmental impacts of any developmental activity 4. To conduct an environmental audit 5. To prepare an environmental impact assessment report 6. To understand various Environmental management Plans
		MP469	**Industrial Psychology & Organizational Behavior**	1. To know the importance of psychology 2. To have insight into individual behavior 3. To have insight into group behavior 4. To study how deal with people in better way 5. To know how to motivate groups 6. To know how to built groups
88		CS492	**PROJECT (120)**	7. To think innovatively on the development of components, products, processes or technologies in the engineering field 8. To carry out calculations involved in design, consider and evaluate alternate assumptions, approaches, a n d procedures. 9. Apply knowledge gained in solving real life engineering problems 10. Ability to use modern design and analysis tools to analyse and evaluate complex problems. 11. To Gain the ability to communicate effectively with written, oral, and visual means in a technical setting.

				12. Ability to serve as effective team member to plan and complete the project/task within a specified budget and time.

		DEPARTMENT OF ELECTRICAL ENGINEERING	
Semester	**Subject Code**	**Subject Name**	Course Outcomes
S5	EET 301	POWER SYSTEMS I	CO 1 Identify the power generating system appropriate for a given area. CO 2 Evaluate the electrical performance of any transmission line. CO 3 Compute various physical characteristics of underground and overhead transmission systems. CO 4 Select appropriate switchgear for protection schemes. CO 5 Design a simple electrical distribution system as per the standards.
S5	EET 303	MICROPROCESSORS AND MICROCONTROLLERS	CO 1 Describe the architecture and timing diagram of 8085 microprocessor. CO 2 Develop assembly language programs in 8085 microprocessor. CO 3 Identify the different ways of interfacing memory and I/O with 8085 microprocessor. CO 4 Understand the architecture of 8051 microcontroller and embedded systems. CO 5 Develop assembly level and embedded C programs in 8051 microcontroller.
S5	EET 305	SIGNALS AND SYSTEMS	CO1-Explain the basic operations on signals and systems. C02-Apply Fourier Series and Fourier Transform concepts for continuous time signals. CO3-Analyze the continuous time systems with Laplace Transform. CO4-Analyze the discrete time system using Z Transform. CO5-Apply Fourier Series and Fourier Transform concepts for Discrete time domain. CO6-Describe the concept of stability of continuous time systems and sampled data systems.
S5	EET 307	SYNCHRONOUS AND INDUCTION MACHINES	CO1-Analyse the performance of different types of alternators. CO2-Analyse the performance of a synchronous motor. CO3-Analyse the performance of different types of induction motors CO4-Describe operating principle of induction machine as generator. CO5-Explain the types of single phase induction motors and their working principle.
S5	EEL 333	ELECTRICAL MACHINES LAB II	CO1-Analyse the performance of single phase and three phase induction motors by conducting suitable tests. CO2-Analyse the performance of three phase synchronous machine from V and inverted V curves. CO3-Analyse the performance of a three phase alternator by conducting suitable tests.

			CO4-students will be able to identify faults occurring in machines and to take corrective measures CO5-students will be able to illustrate laboratory data using professional,graphical representations CO6-students will be able to select appropriate machines based on application requirement
S5	EEL 331	MICROPROCESSO RS AND MICROCONTROLL ERS LAB	CO1-Develop and execute assembly language programs for solving arithmetic and logical problems using microprocessor/microcontroller. CO2-Design and Implement systems with interfacing circuits for various applications. CO3-Execute projects as a team using microprocessor/microcontroller for real life applications
S5	CST 383	CONCEPTS IN MACHINE LEARNING	CO1-Illustrate Machine Learning concepts and basic parameter estimation methods. (Cognitive Knowledge Level: Apply) CO2-Demonstrate supervised learning concepts (regression, linear classification). (Cognitive Knowledge Level: Apply) CO3-Illustrate the concepts of Multilayer neural network and Support Vector Machine (Cognitive Knowledge Level: Apply) CO4-Describe unsupervised learning concepts and dimensionality reduction techniques. (Cognitive Knowledge Level: Apply) CO5-Solve real life problems using appropriate machine learning models and evaluate the performance measures (Cognitive Knowledge Level: Apply)
S5	EET 393	DIGITAL SIMULATION	CO1-Formulate circuit analysis matrices for computer solution. CO2-Apply numerical methods for transient simulation CO3-Develop circuit files for SPICE simulation of circuits. CO4-Develop MATLAB/Simulink programs for simulation of simple dynamic systems.
S5	HUT 300	INDUSTRIAL ECONOMICS AND FOREIGN TRADE	CO1-.Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare. CO2-Take appropriate decisions regarding volume of output and to evaluate the social cost of production. CO3-Determine the functional requirement of a firm under various competitive conditions. CO4-Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society.

			CO5-Determine the impact of changes in global economic policies on the business opportunities of a firm. CO6-Aware of the changes in the composition as well as direction of foreign trade after international trade and know the causes and effects of deficits in the balance of payments, measures adopted to correct the deficits and identify the need for having trade reforms.
S5	MCN 301	DISASTER MANAGEMENT	CO1 Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: Understand). CO2 Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level: Understand). CO3 Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level: Understand) . CO4 Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive knowledge level: Apply) CO5 Identify factors that determine the nature of disaster response and discuss the various disaster response actions (Cognitive knowledge level: Understand). CO6 Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level: Understand)
S6	EET302	LINEAR CONTROL SYSTEMS	CO1-Students will be able to familiarize the elements of control system & its modeling CO2-Students will be able to analyze time response & stability of systems CO3-Students will be able to predict the stability of the system based on the method of root locus technique. CO4-Students will be able to analyze the frequency response & stability of systems CO5-Students will be able to design control systems with compensating techniques using Bode Plot CO6-Students will be able to design control systems with compensating techniques using Root Locus.
S6	EET304	POWER SYSTEMS II	CO 1 Apply the per unit scheme for any power system network and compute the fault levels. CO 2 Analyse the voltage profile of any given power system network using iterative methods. CO 3 Analysethe steady state and transient stability of power system networks. CO 4 Model the control scheme of power systems.

			CO 5 Schedule optimal generation scheme.
S6	EET306	POWER ELECTRONICS	CO 1 Explain the operation of modern power semiconductor devices and its characteristics. CO 2 Analyse the working of controlled rectifiers. CO 3 Explain the working of AC voltage controllers, inverters and PWM techniques. CO 4 Compare the performance of different dc-dc converters. CO 5 Describe basic drive schemes for ac and dc motors.
S6	EET322	RENEWABLE ENERGY SYSTEMS	CO1-Describe the environmental aspects of renewable energy resources CO2-Design of solar thermal systems CO3-Design of solar electric systems CO4-Explain the operation of wind energy systems and small hydro power systems CO5-Explain the energy harvesting systems from ocean CO6-Explain different emerging energy conversion technologies and storage
S6	EEL334	POWER ELECTRONICS LAB	CO1-Determine the characteristics of SCR and design triggering circuits for SCR based circuits CO2-Design, set up and analyse single phase AC voltage controllers CO3-Design, set up and test suitable gate drives for MOSFET/IGBT. CO4-Design, set up and test basic inverter topologies CO5-Design and set up dc-dc converters CO6-Develop simulation models of dc-dc converters, rectifiers and inverters using modern simulation tools
S6	EET308	COMPREHENSIVE COURSE WORK	CO1 To Apply the knowledge of circuit theorems to solve the problems in electrical networks CO2 To Evaluate the performance of DC machines and Transformers under different loading conditions CO3 To Identify appropriate digital components to realise any combinational or sequential logic. CO4 To Apply the knowledge of Power generation, transmission and distribution to select appropriate components for power system operation. CO5 To Apply appropriate mathematical concepts to analyse continuous time and discrete time signals and system CO6 To ensure the comprehensive knowledge of each student in the most fundamental Program core courses in the curriculum

S6	EET396	ANALYSIS OF POWER ELECTRONIC CIRCUITS	CO 1-To Choose appropriate power semiconductor device along with its driver circuits and protection. CO 2-TO Analyse the operation of controlled rectifier circuits and PWM rectifiers. CO3-To Explain the operation of phase controlled rectifiers in inversion mode. CO 4-To Analyse inverter circuits with different modulation strategies. CO5-To Describe the types and working of multilevel inverters. CO 6-To Analyse the operation of DC-DC converters and AC voltage controllers.
S6	HUT 310	MANAGEMENT FOR ENGINEERS	CO1-Explain the characteristics of management in the contemporary context (Cognitive Knowledge level: Understand) CO2-Describe the functions of management (Cognitive Knowledge level: Understand) CO3-Demonstrate ability in decision making process and productivity analysis (Cognitive Knowledge level: Understand) CO4-Illustrate project management technique and develop a project schedule (Cognitive Knowledge level: Apply). CO5-Summarize the functional areas of management (Cognitive Knowledge level: Understand) CO6-Comprehend the concept of entrepreneurship and create business plans (Cognitive Knowledge level: Understand)
S7	EE403	DISTRIBUTED GENERATION AND SMART GRIDS	CO1-To describe various distributed generation systems CO2-To understand about microgrids and their control schemes CO3-To evaluate various developments happening in the field of smart grid CO4-To identify and modify various standards used in smart grid CO5-To outline the cloud computing aspects in smart grid CO6-To analyse the power quality aspects with smart grids
S7	EE405	ELECTRICAL SYSTEM DESIGN	CO1- To make aware of the Acts and Rules regulating the design of electrical .systems in India. CO2- To impart knowledge in the design of low voltage and medium voltage electrical installations. CO3-To give basic knowledge of design of distribution transformer substations, their installations and earthing design for transformer substations CO4-To familiarise lighting calculations and external lighting.

S7	EE407	DIGITAL SIGNAL PROCESSING	CO1: Analyze DT systems with DFT CO2: Design digital filters IIR filters CO3: Design digital filters FIR filters CO4: Analyze finite word length effects in signal processing CO5: Design filters using MATLAB FDA tool box CO6: Understand Digital Signal Controllers and their Applications
S7	EE409	ELECTRICAL MACHINE DESIGN	CO1-To understand principle of operation, behaviour and performance of static and rotating electrical machines CO2-To figure out the application areas of various electrical machines based on their ratings. CO3-To provide the information required for the fabrication of the static and rotating electrical machines CO4-To impart knowledge on principles of Electrical & magnetic design of static and rotating electrical machines. CO5-To furnish the basis and the methodologies to a correct design of the electrical machines (transformers, rotating AC machines and DC machines CO6- To construct a basic idea about computer aided design (CAD) and finite element method to achieve maximum precision in the design of electrical machines.
S7	EE 469	Electrical Hybrid Vehicle	CO 1-Describe the basics of electric and hybrid electric vehicles, their architecture, technologies and fundamentals CO 2-Design a suitable drive scheme for developing an electric hybrid vehicle depending on resources CO 3-Design basic schemes of electric vehicles and hybrid electric vehicles. CO 4-Develop basic schemes of electric vehicles and hybrid electric vehicles. CO 5-Choose proper energy storage systems for vehicle applications CO 6-Identify various communication protocols and technologies used in vehicle networks.
S7	EE451	SEMINAR & PROJECT PRELIMINARY	CO1-Analyse a current topic of professional interest and present it before an audience CO2-Identify an engineering problem, analyse it and propose a work plan to solve it. CO3-To develop skills in doing literature survey, technical presentation and report preparation. CO4-To enable project identification and execution of preliminary works on final semester project

S7	EE 401	Electronics Communication	CO1-Understand the need of modulation in transferring a signal through either wireless or wired communication systems CO2-Be able to apply analog modulation techniques and receiver fundamentals in analog communication. CO3-Be to apply baseband digital encoding & decoding techniques in the storage / transmission of digital signal through wired channel CO4-Understand the performance of communication systems in the presence of noise and interference CO5-Understand the methods and techniques used in communication field. CO6-Understand the applications of communication technology.
S8	CE482	ENVIRONMENTAL IMPACT ASSESMENT	CO1-To study the various types of environmental pollution CO2-To study the impact due to various types of pollutants and their assessment techniques CO3-To have a basic knowledge of various pollution sources and their impacts
S8	BT362	SUSTAINABLE ENERGY PROCESS	CO1-Identify global and Indian energy sources. CO2-Explain capture, conversion and application of solar and wind energy. CO3-Explain conversion of biomass to energy. CO4-Explain the capture of energy from oceans. CO5-Explain fuel cells and energy storage routes.
S8	EE402	Special Electrical Machines	CO1-To acquaint with the concept of AC and DC servo motors CO2-To gain knowledge about the basic principles and classification of stepper motors CO3-Acquire the knowledge of fundamentals ,construction details and classification of universal motors and hysteresis motors CO4-To learn about the construction features and method of control of reluctance & switched reluctance motors CO5-To know about the construction and working of PMDC and BLDC motors CO6-To attain knowledge about the construction, working ,types of linear motors
S8	EE404	Industrial Instrumentation & Automation	CO1. Get a complete overview of strategies for process control CO2. Get the overall concepts of applications of various transducers CO3. Design various signal conditioning systems for transducers CO4. Summarize various concepts of micro electro mechanical system CO5. Use various PLC functions and develop small PLC programs

			CO6. Describe working of various blocks of basic industrial automation system
S8	EE474	Energy Management & Auditing	CO1-To enable the students to understand the concept of energy management and energy management opportunities CO2-To understand the different methods used to control peak demand CO3-To know energy auditing procedure CO4-To understand the different methods used for the economic analysis of energy projects.
	EE492	Project	CO1-To apply engineering knowledge in practical problem solving CO2-To foster innovation in design of products, processes or systems CO3-To develop creative thinking in finding viable solutions to engineering problems CO4-Think innovatively on the development of components, products, processes or technologies in the engineering field. CO5-Apply knowledge gained in solving real life engineering problems

DEPARTMENT OF CIVIL ENGINEERING			
Semester	**Subject Code**	**Subject Name**	**Course Outcomes**
SEM 1 & 2	EST120	BASICS OF CIVIL AND MECHANICAL ENGINEERING	CO1- Recall the role of Civil Engineers in society and relate the various disciplines of Civil Engineering and explain about the different types of buildings and its components. CO2- Explain the different types of building materials used in building construction and describe the importance, objectives and principles of surveying CO3- Explain the method of construction of different components of a building and illustrate about types of masonry and discuss about carious services in building CO4- Analyse thermodynamic cycles and calculate its efficiency. CO5-Illustrate working and features of IC Engines CO6- Explain the basic principles of refrigeration and Air Conditioning and describe working of hydraulic machines and power transmission elements.
	EST100	ENGINEERING MECHANICS	CO1:Recall the principles and theoroms related to rigid body mechanics. CO2: Identify and describe the components of system of forces acting on rigid body. CO3:Apply the conditions of equilibrium to various practical problems involving different force systems. CO4: Apply suitable principles and theoroms to find centroid and moment of inertia of the given rigid bodies. CO5: Apply the condition of rigid body dynamics and rotations to various practical problems.

			CO6: Apply the conditions of simple harmonic motion and mechanical vibrations to various practical problems.
SEM 3 & 4	CET201	MECHANICS OF SOLIDS	CO1:Recall the fundamental terms and theorems associated with mechanics of linear elastic deformable bodies.. CO2: Explain the behavior and response of various structural elements under various loading conditions. CO3: Apply the principles of solid mechanics to calculate internal stresses/strains, stress resultants and strain energies in structural elements subjected to axial/transverse loads and bending / twisting moments CO4:Choose appropriate principles or formula to find the elastic constants of materials making use of the information available. CO5:Perform stress transformations, identify principal planes/stresses and maximum shear stress at a point in a structuralmember. CO6:Analyse the given structural member to calculate the safe load or proportion the cross section to carry the load safely.
	CET203	FLUID MECHANICS AND HYDRAULICS	CO1 Identify various fluid properties and understood about various methods for measurement of pressure and will have deep knowledge various forces acting on fluids under different conditions CO2 Students will be able to understand about stability of floating and submerged bodies and will be able to derive and

			apply general governing equations for various fluid flows. CO3 Apply Bernoulli's equation to fluid flow problems involving venturimeter, orifice meter and pitot tube and compute forces on pipe bend. CO4 Applying formulae of discharge through weirs, notches and orifices and analyze the flow through pipes and the major and minor energy losses CO5 The students become capable of analysis of open channel flows. CO6 Students can explore the factors about hydraulic jump and can familiarize with the characteristics of surface profiles
	CET205	Surveying and Geomatics	CO1:Able to understand the basic principles of surveying, levelling & contouring and their practical applications in the field. CO2:Apply surveying techniques for computation of area and volume, construction of mass diagram and triangulation. CO3: Apply different methods of traverse surveying, theodolite surveying and total station. CO4:Identify the possible errors in surveying and apply surveying techniques to solve problems on correction of bearings, levelling techniques to find elevations of given points. CO5:Apply the basic knowledge of setting out of different types of curves CO6:Understand the basic principles of GPS, Remote sensing & GIS and analyze their latest applications in respective fields.
	EST 200	Design Engineering	CO1 Students will be able to explain different principles involved in design engineering CO2 Students will be able to understand different concepts

			involved in designing.
			CO3 Students will be capable to think of innovative designs incorporating different segments of knowledge gained in the course.
			CO4 Students will be able to choose engineering tools or components for solving the identified engineering problems
			CO5: Students will be aware of product oriented and user oriented aspects that will make design success
			CO6 Students will have a broader perspective of design covering function, cost environmental sensitivity, safety and other factors other than engineering analysis
	MCN200	Sustainable Engineering	CO1:Understand the relevance and concept of sustainability, sustainable development and global initiatives in this regard and applying the same in day to day activities
			CO2:Evaluating the different types of environmental pollution problems and their sustainable solutions.
			CO3:Discuss the different environmental regulations and standards.
			CO4:Students will be able to choose engineering tools or components for solving the identified engineering problems
			CO5: Outline the concepts related to conventional and non- conventional energy and bring necessary awareness in resource utilization.
			CO6: Analyzing the relation between technology and sustainabledevelopment and able to attain a balance between both.
	CET202	Engineering Geology	CO1: The students will be able to recall the fundamental concepts of surface processes, subsurface process , minerals, rocks, ground water and geological factors in Civil Engineering construction
			CO2: The students will be able to identify and describe the

			surface and subsurface processes, earth materials, ground water and geological charecteristics in Civil Engineering constructions. CO3: The students will be able to apply the basic concepts of surface and subsurface processes , minerals , rocks =, ground water and geological charecteristics in Civil Engineering construction.. CO4: Students will be able analyze and classify the geological process , earth materials and ground water. CO5: Students will be able to evaluate geological factors in Civil Engineering Construction. CO6: Students will be able to create safe, stable and economic design and construction of Civil Engineering project by studying various natural hazards, its causes, remedies and prevention
	CET204	Geotechnical Engineering 1	CO1Explain about the origin of soil and various soil properties with reference to phase diagram. CO2 Describe the procedures to determine index properties of any type of soil, and classification of the soil based on its index properties. CO3 Determine permeability property of soils and acquires conceptual knowledge about stresses due to seepage and effective stress; Also acquire ability to estimate seepage losses across hydraulic structure. CO4: Estimate shear strength parameters of different types of soils using the data of different shear tests and comprehend Mohr-Coulomb failure theory. CO5: Describe about compaction and consolidation of soil and determine the settlements of soil due to consolidation CO6: Discuss various methods for determining stability of slopes

	HUT 200	Professional Ethics	CO1 :Understand the core values that shape the ethical behavior of aprofessional
			CO2 :Adopt a good character and follow an ethical life
			CO3 :Explain the role and responsibility in technologicaldevelopment by keeping personal ethics and legal ethics
			CO4 :Solve moral and ethical problems through exploration andassessment by established experiments
			CO5 :Apply the knowledge of Human values and social values tocontemporary ethical values and global issues
			CO6 :Apply the knowledge of Human values and social values tocontemporary ethical values and global issues
	CET206	Transportation Engineering 1	CO1 : Students will be able to design various geometric elements of a highway
			CO2 : Students will be able to determine the characteristics of pavement materials.
			CO3 :Students will be able to design flexible pavements
			CO4 :Students will be able to Conduct traffic engineering studies
			CO5 :Students will be able to analyze data for efficient management of roadway facilities
			CO6 :Students will be able to plan and design basic airport facilities
	CEL202	Material Testing Lab 1	CO1 :Students will be able to understand the behaviour of engineering materials under various forms andstages of

			loading.
			CO2 :Students will be able to characterize the elastic properties of various materials.
			CO3 :Evaluate the strength and stiffness properties of engineering materials undervarious loading conditions.
			CO4 :The students will gain basic knowledge of the characteristics of the materials
			CO5 :Students willl be able to to undertake the testing of materials when subjected to different types ofloading.
			CO6 :Students will be able to evaluate the strength of the material and stiffnessproperties of structural elements.
	CEL204	Fluid Mechanics Lab	CO1 :Students will be able to study and understand the various pipe appurtenances
			CO2 :Students will be able to calibrate the various flow measuring instruments
			CO3 :Students will be able to evaluate the parameters of open channel flow
			CO4 :Students will be able to evaluate the various mathematicalconstants associated with pipes and pipe Fittings
			CO5 :Students willl be able to evaluate the parameters of floating bodies
			CO6 :Students will be able to evaluate the time of emptying through orifices, mouthpieces and notches
SEM 5 &6	CET301	Structural Analysis I	CO1 :Apply the principles of solid mechanics to analyse truss.
			CO2 :Identify the problems with static indeterminancy and

			tackling such problems by means of method of consistent deformations and energy principles. CO3 :Apply specific methods such as slope deflection and moment distribution methods of structural analysis for tpical structures with different charecteristics. CO5 :Apply suitable methods of analysis of various types of structures including cables ,suspension bridges and arches. CO6 :Analyse the effect of moving loads on structure using influence lines
	CET303	Design of Concrete Structures	CO1 :Recall the fundamental concepts of limit state design and code provisions for design of concrete members under bending, shear, compression, and torsion. CO2 :Analyse reinforced concrete sections to determine the ultimate bearing capacity in bending, shear and compression. CO3 :Design and detail beams slab, stairs and footings using IS code provisions. CO4 :Design and detail columns using IS code and SP16 design chart CO5 :Explain the criteria for earthquake resistant design of structures and ductile detailing of concrete structures subjected to seismic forces. CO6: Describe and estimate the different components of hydrologic cycle by processing hydro-meteorological data
	CET305	Geotechnical EngineeringII	CO1 : Students will be able to understand, analyze and compare the various types of earth pressure and theories associated with earth pressure and apply the theories for

			the determination of earthnpressure in the field
			CO2 :Students will be able to understand the bearing capacity theories and apply these theories to determine the bearing capacity of different types of shallow foundations.
			CO3 :Students will be able to understand the various foundation problems and their remedies and also to solve the associated numerical problems.
			CO4 :Students will be able to understand , compare and design the various types of shallow foundations. CO5:Students will be able to understand and design the various types of deep foundations and also analyze the load carrying capacity through suitable tests.
			CO6:Students will be able to understand the various concepts of subsoil investigation and solve the associated numerical problems by applying suitable mathematical equations.
	CET307	Hydrology and Water Resource Engineering	CO1 : To study the fundamental concepts ofsurface and groundwater components of hydrology. CO2 : Determine the crop water requirements for the design of irrigation canals by recollecting the principles of irrigation engineering. CO3 : Perform the estimation of streamflow and/or describe the river behavior and controlstructures. CO4 : Describe and apply the principles of reservoir engineering to estimate the capacity ofreservoirs and their useful life. CO5: Demonstrate the principles of groundwater engineering and apply them for computing theyield of aquifers and wells. CO6:Describe and estimate the different components of hydrologic cycleby processing hydro-meteorological data

CET309	Construction Technology and Management	CO1 : Describe the properties of materials used in construction.
		CO2 :Explain the properties of concrete and its determination.
		CO3 :Describe various elements of building construction.
		CO4 :Explain the technologies for construction. CO5:Describe the procedure for planning and executing public works.
		CO6:Apply scheduling techniques in project planning and control.
MCN301	Disaster Management	CO1 : Define and use various terminologies in use in disaster management parlance and organize each of these terms in relation to the disaster management cycle
		CO2:Distinguish between different hazard types and vulnerability types and do vulnerability assessment.
		CO3 : Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk.
		CO4 : Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community CO5: Identify factors that determine the nature of disaster response and discuss the various disaster response actions
		CO6: Explain the various legislations and best practices for disaster management and risk reduction at national and international level
CEL331	Material Testing Lab II	CO1 :The students will be able to experimentally evaluate of properties of the materials used for concrete

			CO2 :The students will gain basic knowledge of the characteristics of the materials
			CO3 :The students will gain basic knowledge of mix proportion
			CO4 :The students will be able to assess the quality of building materials CO5 :The students will be able to know about water cement ratio and its significance.
			CO6 :The students will be able to understand basic field and lab test
	CEL333	Geotechnical Engineering lab	CO1 :Students will able to determine the atterberg limits of the given soil
			CO2 :Students will be able to determine the particle size distribution of the given soil
			CO3 :Students will be able to determine the moisture content and permeability of the given soil
			CO4 :Students will be able to determine the shear strength of the given soil
			CO5 :Students will be able to determine the strength of the subgrade soil
			CO6 :Students will be able to determine the specific gravity and density of the given soil.
	CET302	Structural Analysis II	CO1 :Understand the principles of plastic theory and its applications in structural analysis
			CO2 :Examine the type of structure and decide on the method of analysis.

			CO3 :Apply approximate methods of analysis for framed structures to ascertain stress resultants approximately but quickly.
			CO4 Apply force method to analyse the framed structures
			CO5 :Apply displacement method to analyse the framed structures CO6 :Remember basic dynamics, understand the basic principles of structural dynamics and apply the same to simple structures.
	CET304	Environmental Engineering	CO1 :To appreciate the role of environmental engineering in improving the quality of environment.
			CO2 :To plan for collection and conveyance of water and waste water.
			CO3 :To enhance natural water purification processes in an Engineered environment.
			CO4 :To decide an appropriate technology for water and waste water treatment
			CO5 :The students will know the deign procedures of filtration units. CO6 :Students will getting the knowledge about removal of colour, odour and micro organisms from water.
	CET306	Design of Hydraulic Structures	CO1 :To understand the causes of failure, principles of design of different components of hydraulic structures
			CO2 : To study the features of canal structures and perform the design of alluvial canals
			CO3 : To create awareness on the hydraulic design of minor irrigation structures such as cross drainage works,

			canal falls, cross regulator.
			CO4 : To study the scaled drawings of different minor irrigation structures
			CO5 : To understand the design principles and features of dams and perform the stability analysis of gravity dams
			CO6 : To study the different types of dams and their components
	CET308	Comprehensive Course Work	CO1 :Learn to prepare for a competitive examination
			CO2 :Comprehend the questions in Civil Engineering field and answer them with confidence
			CO3: Communicate effectively with faculty in scholarly environments
			CO4 :Analyze the comprehensive knowledge gained in basic courses in the field of Civil Engineering
	CEL332	Transportation Engineering Lab	CO1- To enable experimental evaluation of properties of the materials used for pavement
			CO2- To obtain the characteristics of the materials
			CO3- To enable the students to conduct different tests to find various properties of aggregates, bitumen and soil subgrade
			C04-To assess suitability of material in pavement construction
			CO5- To enable students to have a strong analytical and practical knowledge on experiment

			CO6- Ability to compare experimental results to the theoretical results and write technical reports
	CEL333	Civil Engineering Software Lab	CO1- To familiarize and give hands-on training to students in the following areas of civil engineering application software
			C02- Analysis and design of plane and space frames (steel and RCC) using STAAD
			C03- Students will be able to develop and program engineering analysis problems using spreadsheet
			C04- To provide students with adequate knowledge and experience in preparing engineering drawings using AUTOCAD
			CO5- To help students acquire the skills pertinent to the production of properly detailed, formatted and dimensioned civil engineering drawings
			CO6- To enable the use of project management software
SEM 7 & 8	CE401	Design of Steel Structures	CO1 :To understand the design of bolted and welded connections
			CO2 :Students will be able to design tension members and beams using the IS specifications
			CO3 :Ability of the students to design columns under axial loads using IS specifications
			CO4 :Ability of the students to design columns under axial loads using IS specifications

			CO5 :Students will be able to assess loads on truss and design purlins
			CO6 :Students are able to understand types of timber , apply relevant codes to design it to resist axial forces, bending and shear
	CE403	Structural Analysis III	CO1 :The students will be able to analyse multi-storeyed frames for vertical and horizontal loads
			CO2 :The students will be able to understand the basic concepts and definitions of matrix analysis of structures
			CO3 :The students will be able to develop flexibility matrix of a structure and will be able to analyse simple plane trusses and plane frames using flexibility method
			CO4 :The students will be able to develop stiffness matrix of a structure and will be able to analyse simple plane trusses and plane frames using stiffness method (physical approach)
			CO5 :The students will be able to analyse simple plane trusses and plane frames using direct stiffness method
			CO6 :The students will be able to understand the basic concepts of structural dynamics and to know about single degree of freedom system, foundation vibration analysis and basis of two degree of freedom

	CE405	Environmental Engineering1	CO1 :Identify the significance of water resources and the factors affecting the quality and quantity of water
			CO2 :The students will become aware of the various pollutants affecting water quality analysis of water quality
			CO3 :The students will know about the different treatment units available in a water treatment plant and their design sedimentation tanks.
			CO4 :The students will know the deign procedures of filtration units.
			CO5 :Students will getting the knowledge about removal of colour, odour and micro organisms from water.
			CO6 :The students will become aware of various water distribution methods.
	CE407	Transportation Engineering II	CO1 :Students will be able to understand about basic facts, developments and future plans of Indian railways
			CO2 :Students will be able to understand the various components of railway track and perform the geometric design of railway track
			CO3 :Students will be able to understand the concepts of points and crossings, signals and track circuiting in Railways
			CO4 :Students will be able to understand about various equipment used for track maintenance, various causes of catastrophic accidents and various methods to ensure transportation safety in Railways

	CE409	Quantity Survey and Valuation	CO5 :Students will be able to understand about tunnel surveying, tunnel construction procedure and various facilities in tunnel
			CO6 :Students will be able to understand the various components of harbours, breakwaters and docks
	CE409	Quantity Survey and Valuation	CO1 :Student will have the confidence to prepare detailed and abstract estimationsfor roads and building and the student will have the ability to prepare aspecification
			CO2 :The student can prepare the rate of every items of building and the materialsand labour rate
			CO3 :The student will have the ability to prepare detailed estimate for variousStructures
			CO4 :The students will be able to understand the procedure to carry out theestimation and steps to prepare reports of construction works
			CO5 :Student will demonstrate the ability to prepare valuation of buildings
			CO6 :The student will be getting knowledge about contracts and tenders..
	CE467	Highway Pavement Design	CO1 :To identify the concept of highway pavements, material properties and their design concepts
			CO2 :To analyze and design flexible pavements by using both semi empirical and theoretical

			approaches
			CO3 :To be capable to analyze and design rigid pavements by selecting the most appropriate method
			CO4 :To understand and apply design concepts of cement concrete pavements
			CO5 :To evaluate pavements in detail by various approaches
			CO6 :To arrive at standard platforms so as to design pavement overlays
	CE451	Seminar and Project	CO1 :To review various literatures and arrive at conclusions
			CO2 :To apply research based knowledge for the completion of proposed works
			CO3 :To explore modern tools for the completion of proposed research work.
			CO4 :To carry out proposed work plans through systematic team work
			CO5 : To present the completed research work professionally
			CO6 :To prepare the detailed report of a completed research work
	CE431	Environmental Engineering Lab	CO1- The students will be able to understand the importance of water quality standards

			CO2- The student will be able to analyse the chemical characteristics of a given water sample viz. pH, acidity, alkalinity
			CO3- The student will be able to analyse the physical characteristics viz. colour, turbidity, and conductivity of a given water sample
			CO4- To analyse the chemical characteristics of a given water sample viz. chlorides, Iron, Available Chlorine and sulphates content to assess its suitability for drinking purposes
			CO5- The student will be able to determine the Biological Oxygen Demand and Chemical Oxygen Demand in waste water CO6- The student will be able to analyse the Dissolved oxygen content in water, optimum dosage of alum using Jar test
	CE402	Environmental Engineering II	CO1 :Students will be able to understand the various characteristics of the waste water and methods for their testing
			CO2 :Students will be able to understand the various appurtenances used in the various sewerage systems
			CO3 :Students will be able to apply the mathemetical concepts for the design of sewers
			CO4 :Students will be able to understand, analyze and design the various components in a sewage treatment system
			CO5 :Students will be able to understand and apply the concepts of sewage disposal

	CE404	Civil Engineering Project Management	CO6 :Students will be able to understand, analyze and design the various sludge digestion systems
			CO1 :The students will be able recall the resources required, various terms used principles of ethics in decision making for civil engineering construction works with emphasis on sustainable construction.
			CO2: The students will be able to understand various terms used , legal procedures safety practices for civil engineering works.
			CO3: The students will be able draw the network diagram based on number the events for various activities of a project
			CO4: The students will be able categorize an appropriate construction resources and procedure for a specific job
			CO5: The students will be able to plan and schedule a construction project for timely accomplishment
			CO6: The students will be able to formulate suitable quality management plan for construction
	CE474	Muncipal Solid Waste Management	CO1 : Outline sources, types and composition of solid waste
			CO2: Explain municipal solid waste management systems with respect to its physical properties
			CO3: Discuss the solid waste collection systems, route optimization techniques and processing of solid wastes.
			CO4: Outline the design, operation, and maintenance of different methods of treatment
			CO5: Examine the operation, and maintenance of Incineration & sanitary landfill
			CO6: To be familiar with types of composting, Anaerobic

	CE462	Town and Country Planing	CO1 : To understand the goals and objectives of planning and to identify various components of planning.
			CO2: To familiarize about the theories of urbanization, urban forms, urban structure and its characteristics.
			CO3: To understand the zonal development plans, organizational legal financial aspects of plan implementation and public participation in plan formulation.
			CO4: To familiarize with Regional planning, Spatial standards for various facility areas and utilities and the applications of various provisions of Town Planning Act.
			CO5: To analyze the concept of development of new towns, zoning and urban renewal.
			CO6: To create base maps for urban development using the techniques of preparation.
	CE492	Project	CO1 :To review various literatures and arrive at conclusions
			CO2 :To apply research based knowledge for the completion of proposed works
			CO3 :To explore modern tools for the completion of proposed research work
			CO4 :To carry out proposed work plans through systematic team work
			CO5 : To present the completed research work

digestion of wastes, & Biogas digesters

			professionally
			CO6 :To prepare the detailed report of a completed research work
	BT362	Sustainable Energy Process	CO1:Identify global and Indian energy sources.
			CO2:Apply the solar energy in various applications in real world.
			CO3:Analyse the extraction and conversion of Wind energy.
			CO4 :Illustrate the extraction and application of Biomass in to energy
			CO5 :Understand the conversion of ocean energy in to electricity
			CO6 :Understand various types of fuels cells and its application

	ROYAL COLLEGE OF ENGINEERING & TECHNOLOGY (RCET)
	CHIRAMANANGAD P O, AKKIKAVU, THRISSUR-680604

All Course Outcomes (COs) of all subjects (Odd and Even) for the academic year 2021-2022 approved by the **Department Advisory Committee** is attached herewith.

Semester	Subject Code	Subject Name	Course Outcomes
S5	ECT301	LIC	CO 1 Understand Op Amp fundamentals and differential amplifier configurations CO 2 Design operational amplifier circuits for various applications CO 3 Design Oscillators and active filters using opamps CO4 Explain the working and applications of timer, VCO and PLL ICs CO5 Outline the working of Voltage regulator IC%u2019s and Data converters
	ECT303	DIGITAL SIGNAL PROCESSING	1. State and prove the fundamental properties and relations relevant to DFT and solve basic problems involving DFT based filtering methods 2. Compute DFT and IDFT using DIT and DIF radix-2 FFT algorithms 3. Design linear phase FIR filters and IIR filters for a given specification 4. Illustrate the various FIR and IIR filter structures for the realization of the given system function 5. Explain the basic multi-rate DSP operations decimation and interpolation in both time and frequency domains using supported mathematical equations 6. Explain the architecture of DSP processor (TMS320C67xx) and the finite word length effects

	ECT305	ANALOG & DIGITAL COMMMUNICATION SYSTEM	1. Explain the existent analog communication systems. 2.Apply the concepts of random processes to LTI systems. 3. Apply waveform coding techniques in digital transmission. 4. Apply GS procedure to develop digital receivers. 5. Apply equalizer design to counteract ISI. 6.Apply digital modulation techniques in signal transmission.
	ECT307	**CONTROL SYSTEMS**	1.Analyse electromechanical systems by mathematical modelling and derive their transfer functions 2. Determine Transient and Steady State behaviour of systems using standard test signals 3. Determine absolute stability and relative stability of a system 4. Apply frequency domain techniques to assess the system performance and to design a control system with suitable compensation techniques 5. Analyse system Controllability and Observability using state space representation 6. to develop the skills for mathematical modelling of various control systems and stability analysis using time domain and frequency domain approaches.
	ECL331	ANALOG INTEGRATED CIRCUITS AND SIMULATION LAB	1. Use data sheets of basic Analog Integrated Circuits and design and implement application circuits using Analog ICs. 2. Design and simulate the application circuits with Analog Integrated Circuits using simulation tools. 3. Function effectively as an individual and in a team to accomplish the given task. 4. familiarize students with the Analog Integrated Circuits and Design.

			5. familiarize students with simulation of basic Analog Integrated Circuits 6. Implementation of application circuits using basic Analog Integrated Circuits
	ECL333	**DIGITAL SIGNAL PROCESSING LABORATORY**	1. Simulate digital signals 2. verify the properties of DFT computationally 3. Familiarize the DSP hardware and interface with computer 4. Implement LTI systems with linear convolution. 5. Implement FFT and IFFT and use it on real time signals. 6. Implement FIR low pass filter.
S6	ECT302		CO1- To summarize the basic mathematical concepts related to electromagnetic vector fields CO2- Analyse Maxwell's equation in different forms and apply them to diverse engineering problems CO3- To analyse electromagnetic wave propagation and wave polarization CO4 To analyse the characteristics of transmission lines and solve the transmission line problems using Smith chart. CO5- To analyse and evaluate the propagation of EM waves in Wave guides. CO6- Analyse the propogation of EM wave
	ECT304		CO1- Explain the various methodologies in ASIC and FPGA design. CO2- Design VLSI Logic circuits with various MOSFET logic families CO3- Compare different types of memory elements. CO4- Design and analyse data path elements such as Adders and multipliers. CO5- Explain MOSFET fabrication techniques and layout design rules. CO6- design & analyse the layout & stick diagram
	ECT306	.	CO1- Explain measures of information, entropy, conditional entropy, mutual information CO2- Apply Shannon source coding theorem for data compression.

			CO3-Apply the concept of channel capacity for characterize limits of error-free transmission CO4-Apply linear block codes for error detection and correction CO5-Apply algebraic codes with reduced structural complexity for error correction CO6- Understand encoding and decoding of convolutional and LDPC codes
	ECT362	INTRODUCTION TO MEMS	CO1- Describe the working principles of micro sensors and actuators CO2- Identify commonly used mechanical structures in MEMS CO3- Explain the application of scaling laws in the design of micro systems CO4- Identify the typical materials used for fabrication of micro systems CO5- Explain the principles of standard micro fabrication techniques CO6- Describe the challenges in the design and fabrication of Micro systems
	HUT310	Management for Engineers	1. Explain the characteristics of management in the contemporary context (Cognitive Knowledge level: Understand). 2. Describe the functions of management (Cognitive Knowledge level: Understand) 3. Demonstrate ability in decision making process and productivity analysis (Cognitive Knowledge level: Understand). 4. Illustrate project management technique and develop a project schedule (Cognitive Knowledge level: Apply). 5. Summarize the functional areas of management (Cognitive Knowledge level: Understand). 6. Comprehend the concept of entrepreneurship and create business plans (Cognitive Knowledge level: Understand).

	ECT308	COMPREHENSIVE COURSE WORK	1.Apply the knowledge of circuit theorems and solid state physics to solve the problems in electronic Circuits 2. Design a logic circuit for a specific application 3. Design linear IC circuits for linear and non-linear circuit applications 4. Explain basic signal processing operations and Filter designs 5. Explain existent analog and digital communication systems 6. ensure the comprehensive knowledge of each student in the most fundamental Program core courses in the curriculum
	ECL332	COMMUNICATION LAB	1. Setup simple prototype circuits for waveform coding and digial modulation techniques working in a team. 2. Simulate the error performance of a digital communication system using standard binary and M -ary modulation schemes. 3. Develop hands-on skills to emulate a communication system with software-designed-radio working in a team. 4. Generate a sinusoidal waveform with a DC offset so that it takes only positive amplitude value. 5. Sample and quantize the signal using an uniform quantizer with number of representation levels L. Vary L. Represent each value using decimal to binary encoder 6. Simulate transmission of baseband signal via an AWGN channel
	ECD334	MINI PROJECT	CO1: Be able to practice acquired knowledge within the selected area of technology for project development. CO2: Identify, discuss and justify the technical aspects and design aspects of the project with a systematic approach. CO3: Reproduce, improve and refine technical aspects for engineering projects. CO4: Work as a team in development of technical projects. CO5: Communicate and report effectively project related activities and findings.

			CO6: Equip students in working with projects and to take up research work in connected areas
S7	EC401	**INFORMATION THEORY & CODING**	1.To introduce the concept of information 2. To understand the limits of error free representation of information signals and the transmission of such signals over a noisy channel 3. To design and analyze data compression techniques with varying efficiencies as per requirements 4. To understand the concept of various theorems proposed by Shannon for efficient data compression and reliable transmission 5. To give idea on different coding techniques for reliable data transmission 6. To design an optimum decoder for various coding schemes used.
	EC403	**MICROWAVE & RADAR ENGINEERING**	• Able to understand the basics of microwave its advantages and application • Able to understand the various microwave sources, their principle of operation and its efficiency • Able to understand measurement of various parameters of microwaves • Able to understand various microwave hybrid circuits and formulate their S matrices • Able to understand various microwave diodes and transistors • Able to understand the basic concepts, types,

			working of radar and introduce to radar transmitters and receivers
	EC405	**OPTICAL COMMUNICATION**	1. Know the working of optical source and detectors. 2. Compare the performance of various optical modulation schemes. 3. Apply the knowledge of optical amplifiers in the design of optical link. 4. Analyse the performance of optical amplifiers. 5. Know the concept of WDM 6. Describe the principle of FSO and LiFi.
	EC407	**COMPUTER COMMUNICATION**	i.Different types of network topologies and protocols. ii. The layers of the OSI model and TCP/IP with their functions. iii. The concept of subnetting and routing mechanisms. iv. The basic protocols of computer networks, and how they can be used to assist in network design and implementation. v. Security aspects in designing a trusted computer communication system. vi.to study about various security mechanisms
	EC 451	SEMINAR	The students will be able to i. Analyse a current topic of professional interest and present it before an audience. ii. Identify an engineering problem, analyse it and propose a work plan to solve it. iii. Develop plans with relevant people to achieve the project's goals. iv. Break work down into tasks and determine handover procedures. v. Estimate and cost the human and physical resources required. iv. Make plans to obtain the necessary resource.

	EC431	**COMMUNICATION SYSTEMS LAB (OPTICAL & MICROWAVE)**	1. Setup simple prototype circuits for waveform coding and digial modulation techniques working in a team. 2. Simulate the error performance of a digital communication system using standard binary and M -ary modulation schemes. 3. Develop hands-on skills to emulate a communication system with software-designed-radio working in a team. 4. Generate a sinusoidal waveform with a DC offset so that it takes only positive amplitude value. 5. Sample and quantize the signal using an uniform quantizer with number of representation levels L. Vary L. Represent each value using decimal to binary encoder 6. Simulate transmission of baseband signal via an AWGN channel
	EC409	**CONTROL SYSTEMS**	**i.** Represent mathematically a systems and deriving their transfer function model. **ii.** Analyse the time response and frequency response of the systems for any input **iii.** Find the stability of system **iv.** Design a control system with suitable compensation techniques **v.** Analyse a digital control system. vi.To introduce basic concepts of digital control systems.
S8	EC 402	NANOELECTRONICS	CO1:To be able to understand basic concepts of nanoelectronic devices and nano technology. **CO2** :Able to give the knowledge about IC Fabrication Techniques **CO3** :To get a design knowledge about Array multiplier **CO4** :To provide a sound understanding of current semiconductor devices and technology to appreciate its

			applications to electronics circuits and systems **CO5** :To understand about various nanoelectronic devices **CO6** :To give a knowledge about Transport of charge in Nanostructures under Electric field and Magnetic field

	EC 404	Advanced communication systems	1. Understand microwave communication system and analyse microwave transmitters,repeaters and receiver
			2. Understand principles of digital video and component video signal and able to describe and differentiate working principles of latest digital TV, HDTVetc
			3.Explain the basics of satellite communication and analyzes link budget of satellite signal for proper communication
			4.To introduce the state variable analysis method. Know modern multiple access schemes, the concept of frequency reuse, channel assignment
			   strategies and estimate trucking and GOS
			5.Understand GSM, CDMA concepts, architecture, frame structure, system capacity and services.
			6.Know basic concepts about various multiple access techniqes
			
			   •

	EC468	SECURE COMMUNICATION	1. •To impart the students about the theory and technology behind the secure communication 2. Exposed to the different approaches that handle security and the algorithms in use for maintaining data integrity and authenticity. 3. Enabled student to appreciate the practical aspects of security

			features design and their implementation
			4. Introduction on Security, Security Goals, Types of Attacks, Modular arithmetic
			5.Enabled student to appreciate the practical aspects of security features design
			6. Exposed to the different approaches that handle security
	EC492	PROJECT	1. To apply engineering knowledge in practical problem solving
			2. To foster innovation in design of products, processes or systems
			3. To develop creative thinking in finding viable solutions to engineering problems
			4. Think innovatively on the development of components, products, processes or technologies in the engineering field
			5. Apply knowledge gained in solving real life engineering problems
			6. Detailed Analysis/Modelling/Simulation/Design/Problem Solving/Experiment

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	CHIRAMANANGAD P O, AKKIKAVU, THRISSUR-680604

(COs) of all subjects (Odd and Even) for the academic year 2021-2022 approved by the **Department Advisory Committee** is attached herewith. Head of the Department (**HOD**)

SL.NO.	Subject Code	Subject Name	Course Outcomes
1	MA 102	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	CO1-To Solve and interpret any physical or engineering problems. CO2-To parameterize interior regions and solids in two dimensional plane three dimensional space CO3-To analyze geometric meaning of partial differentiation and multiple integrals CO4-To determine whether or not real series are convergent by comparison with standard series or using different test CO5-To identify & analyze vector valued functions and its calculus CO6-To apply and interpret multiple integrals in vector calculus

2	HUN 102	PROFESSIONAL COMMUNICATION	CO 1 Develop vocabulary and language skills relevant to engineering as a profession CO 2 Analyze, interpret and effectively summarize a variety of textual content CO 3 Create effective technical presentations CO 4 Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus CO 5 Identify drawbacks in listening patterns and apply listening techniques for specific needs CO 6 Create professional and technical documents that are clear and adhering to all the necessary conventions
3	MAT101	LINEAR ALGEBRA AND CALCULUS	CO1- To Solve and interpret any physical or engineering problems. CO2- To parameterize curves and regions in two dimensional plane CO3- To develop the ability to integrate knowledge and ideas of complex differentiation and complex integrations in a meaningful manner CO4- To demonstrate ability to think critically by proving mathematical conjectures and establishing theorems
			CO5- To evaluate the real integrals using couture integrals CO6- To apply and interpret vectors in two and three dimensional space algebraically

4	EST 120	BASICS OF CIVIL & MECHANICAL ENGINEERING	CO 1 Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering. CO 2 Explain different types of buildings, building components, building materials and building construction CO 3 Describe the importance, objectives and principles of surveying. CO 4 Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps CO 5 Discuss the Materials, energy systems, water management and environment for green buildings. CO 6 Analyse thermodynamic cycles and calculate its efficiency CO 7 Illustrate the working and features of IC Engines CO 8 Explain the basic principles of Refrigeration and Air Conditioning CO 9 Describe the working of hydraulic machines CO 10 Explain the working of power transmission elements CO 11 Describe the basic manufacturing, metal joining and machining processes

5	EST 130	BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING	CO 1 Apply fundamental concepts and circuit laws to solve simple DC electric circuits CO 2 Develop and solve models of magnetic circuits CO 3 Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state CO 4 Describe working of a voltage amplifier CO 5 Outline the principle of an electronic instrumentation system CO 6 Explain the principle of radio and cellular communication
6	PH110	ENGINEERING PHYSICS B NON CIRCUIT BRANCHES	CO 1 Compute the quantitative aspects of waves and oscillations in engineering systems. CO 2 Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments. CO 3 Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices. CO 4 Apply the knowledge of ultrasonics in non-destructive testing and use the principles of acoustics to explain the nature and characterization of acoustic design and to provide a safe and healthy environment CO 5 Apply the comprehended knowledge about laser and fibre optic communication systems in various engineering applications

7	PH 120	ENGINEERING PHYSICS LAB	CO 1 Develop analytical/experimental skills and impart prerequisite hands on experience for engineering laboratories CO 2 Understand the need for precise measurement practices for data recording CO 3 Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations CO 4 Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics CO 5 Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results
8	CYT 100	ENGINEERING CHEMISTRY	CO 1 Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields. CO 2 Understand various spectroscopic techniques like UV-Visible, IR, NMR and its applications. CO 3 Apply the knowledge of analytical method for characterizing a chemical mixture or a compound. Understand the basic concept of SEM for surface characterisation of nanomaterials. CO 4 Learn about the basics of stereochemistry and its application. Apply the knowledge of conducting polymers and advanced polymers in engineering. CO 5 Study various types of water treatment methods to develop skills for treating wastewater.

9	CYL 120	ENGINEERING CHEMISTRY LAB	CO 1 Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses CO 2 Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs CO 3 Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds CO 4 Acquire the ability to understand, explain and use instrumental techniques for chemical analysis CO 5 Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments CO 6 Function as a member of a team, communicate effectively and engage in further learning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum
10	ESL 120	CIVIL AND MECHANICAL WORKSHOP	CO 1 Name different devices and tools used for civil engineering measurements CO 2 Explain the use of various tools and devices for various field measurements CO 3 Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work. CO 4 Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing. CO 5 Compare different techniques and devices used in civil engineering measurements CO 6 Identify Basic Mechanical workshop operations in accordance with the material and objects CO 7 Apply appropriate Tools and Instruments with respect to the mechanical workshop trades CO 8 Apply appropriate safety measures with respect to the mechanical workshop trades

11	EST 102	PROGRAMMING IN C	CO 1 Analyze a computational problem and develop an algorithm/flowchart to find its solution CO 2 Develop readable* C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators. CO 3 Write readable C programs with arrays, structure or union for storing the data to be processed CO 4 Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem CO 5 Write readable C programs which use pointers for array processing and parameter passing CO 6 Develop readable C programs with files for reading input and storing output
12	ESL 130	ELECTRICAL & ELECTRONICS WORKSHOP	CO 1 Demonstrate safety measures against electric shocks. CO 2 Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols CO 3 Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings CO 4 Identify and test various electronic components CO 5 Draw circuit schematics with EDA tools CO 6 Assemble and test electronic circuits on boards CO 7 Work in a team with good interpersonal skills

13	EST 110	ENGINEERING GRAPHICS	CO 1 Draw the projection of points and lines located in different quadrants CO 2 Prepare multiview orthographic projections of objects by visualizing them in different positions CO 3 Draw sectional views and develop surfaces of a given object CO 4 Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions. CO 5 Convert 3D views to orthographic views CO 6 Obtain multiview projections and solid models of objects using CAD tools
14	EST 100	ENGINEERING MECHANICS	CO 1 Recall principles and theorems related to rigid body mechanics CO 2 Identify and describe the components of a system of forces acting on the rigid body CO 3 Apply the conditions of equilibrium to various practical problems involving different force system. CO 4 Choose appropriate theorems, principles or formulae to solve problems of mechanics. CO 5 Solve problems involving rigid bodies, applying the properties of distributed areas and masses
15	HUN 101	LIFE SKILLS	CO 1 Define and Identify different life skills required in personal and professional life CO 2 Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress. CO 3 Explain the basic mechanics of effective communication and demonstrate these through presentations. CO 4 Take part in group discussions CO 5 Use appropriate thinking and problem solving techniques to solve new problems CO 6 Understand the basics of teamwork and leadership

16	MET 201	MECHANICS OF SOLIDS	CO 1 Determine the stresses, strains and displacements of structures by tensorial and graphical (Mohr's circle) approaches CO 2 Analyse the strength of materials using stress-strain relationships for structural and thermal loading CO 3 Perform basic design of shafts subjected to torsional loading and analyse beams subjected to bending moments CO 4 Determine the deformation of structures subjected to various loading conditions using strain energy methods CO 5 Analyse column buckling and appreciate the theories of failures and its relevance in engineering design
17	MET 203	MECHANICS OF FLUIDS	CO1 Define Properties of Fluids and Solve hydrostatic problems CO2 Explain fluid kinematics and Classify fluid flows CO3 Interpret Euler and Navier-Stokes equations and Solve problems using Bernoulli's equation CO4 Evaluate energy losses in pipes and sketch energy gradient lines CO5 Explain the concept of boundary layer and its applications CO6 Use dimensional Analysis for model studies
18	MET 205	METALLURGY & MATERIAL SCIENCE	CO 1 Understand the basic chemical bonds, crystal structures (BCC, FCC, and HCP), and their relationship with the properties. CO 2 Analyze the microstructure of metallic materials using phase diagrams and modify the microstructure and properties using different heat treatments. CO 3 How to quantify mechanical integrity and failure in materials. CO 4 Apply the basic principles of ferrous and non-ferrous metallurgy for selecting materials for specific applications. CO 5 Define and differentiate engineering materials on the basis of structure and properties for engineering applications.

19	MET 282	FLUID MECHANICS & MACHINERY	CO 1 Define Properties of Fluids and Solve hydrostatic problems CO 2 Explain fluid kinematics and Classify fluid flows CO 3 Interpret Euler's equation and Solve problems using Bernoulli's equation CO 4 Explain the working of turbines and Select a turbine for specific application. CO 5 Explain the characteristics of centrifugal and reciprocating pumps
20	MET 285	MATERIAL SCIENCE & TECHNOLOGY (MINOR)	CO 1 Understand the basic chemical bonds, crystal structures and their relationship with the properties. CO 2 How to quantify failure of materials CO 3 Given a hypothetical or real problem with an electronic materials device or process, explain the cause of the problem and propose solutions. CO 4 Understand how materials interact at the nanoscale CO 5 Define and differentiate engineering materials on the basis of structure and properties for engineering applications
21	MET 202	ENGINEERING THERMODYNAMICS	CO1 Understand basic concepts and laws of thermodynamics CO2 Conduct first law analysis of open and closed systems CO3 Determine entropy and availability changes associated with different processes CO4 Understand the application and limitations of different equations of state CO5 Determine change in properties of pure substances during phase change processes CO6 Evaluate properties of ideal gas mixtures
22	MET 204	MANUFACTURING PROCESS	CO 1 Illustrate the basic principles of foundry practices and special casting processes, their advantages, limitations and applications. CO 2 Categorize welding processes according to welding principle and material. CO 3 Understand requirements to achieve sound welded joint while welding different similar and dissimilar engineering materials. CO 4 Student will estimate the working loads for pressing, forging, wire drawing etc. processes CO 5 Recommend appropriate part manufacturing processes when provided a set of functional

			requirements and product development constraints.
23	MET 206	FLUID MACHINERY	CO1 Explain the characteristics of centrifugal and reciprocating pumps CO2 Calculate forces and work done by a jet on fixed or moving plate and curved plates CO3 Explain the working of turbines and Select a turbine for specific application. CO4 Analyse the working of air compressors and Select the suitable one based on application. CO5 Analyse gas turbines and Identify the improvements in basic gas turbine cycles. CO6 Explain the characteristics of centrifugal and reciprocating pumps
24	MEL 202	FM & HM LAB	CO 1 Determine the coefficient of discharge of flow measuring devices (notches, orifice meter and Venturi meter) CO 2 Calibrate flow measuring devices (notches, orifice meter and Venturi meter) CO 3 Evaluate the losses in pipes CO 4 Determine the metacentric height and stability of floating bodies CO 5 Determine the efficiency and plot the characteristic curves of different types of pumps and turbines
25	MEL 204	MACHINE TOOLS LAB	CO 1 The students can operate different machine tools with understanding of work holders and operating principles to produce different part features to the desired quality. CO 2 Apply cutting mechanics to metal machining based on cutting force and power consumption. CO 3 Select appropriate machining processes and process parameters for different metals. CO 4 Fabricate and assemble various metal components by welding and students will be able to visually examine their work and that of others for discontinuities and defects. CO 5 Infer the changes in properties of steel on annealing, normalizing, hardening and tempering

26	MET 282	THEORY OF MACHINES	CO 1 Interpret basic principles of mechanisms and machines and Analyse a given mechanism based on velocity and acceleration. List the basic selection requirements of different types of mechanical clutches. CO 2 Describe the theories of gears and gear trains. List the basic selection requirements of different types of mechanical brakes. CO 3 Develop the profile of CAMs as per the requirements and to understand cam profile. CO 4 Explain the dynamic balancing of revolving and reciprocating masses. Describe the fundamentals of gyroscope and its application. CO 5 Analyse the performance of governors and flywheels
27	MET 284	THERMODYNAMICS	CO1 Understand basic concepts and laws of thermodynamics CO2 Conduct first law analysis of open and closed systems CO3 Determine entropy changes associated with different processes CO4 Understand the application and limitations of the ideal gas equation of state CO5 Determine change in properties of pure substances during phase change processes CO6 Evaluate properties of ideal gas mixtures
28	MET 286	MANUFACTURING TECHNOLOGY (MINOR)	CO 1 Illustrate the basic principles of foundry practices and special casting processes, their advantages, limitations and applications. CO 2 Categorize welding processes according to welding principle and material. CO 3 Understand the advantages of LBM and EBM over fusion welding process. CO 4 An ability to understand the principles of the basic microelectronic processing technology. CO 5 Learn about key aspects of the microelectronics industry, from device design, to processing, to photolithography, to manufacturing and packaging. Students will come out knowing the core processes of ion implantation, diffusion, oxidation, deposition, etching, including the fundamental physical mechanisms, and the necessary understanding for using these processes in a

			manufacturing environment.
29	MAT 201	PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS	CO 1 Understand the concept and the solution of partial differential equation. CO 2 Analyse and solve one dimensional wave equation and heat equation. CO 3 Understand complex functions, its continuity differentiability with the use of CauchyRiemann equations. CO 4 Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function CO 5 Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.
30	MAT 203	DISCRETE MATHEMATICAL STRUCTURES	CO1 Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic (Cognitive Knowledge Level: Apply) CO2 Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion (Cognitive Knowledge Level: Apply) CO3 Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science (Cognitive Knowledge Level: Understand) CO4 Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science (Cognitive Knowledge Level: Apply) CO5 Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients (Cognitive Knowledge Level: Apply) CO6 Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups (Cognitive Knowledge Level: Understand)

31	MAT 281	ADVANCED LINEAR ALGEBRA	CO 1 Identify many of familiar systems as vector spaces and operate with them using vector space tools such as basis and dimension. CO 2 Understand linear transformations and manipulate them using their matrix representations. CO 3 Understand the concept of real and complex inner product spaces and their applications in constructing approximations and orthogonal projections CO 4 Compute eigenvalues and eigenvectors and use them to diagonalize matrices and simplify representation of linear transformations CO 5 Apply the tools of vector spaces to decompose complex matrices into simpler components, find least square approximations, solution of systems of differential equations etc.
32	MAT 202	PROBABILITY STATISTICS AND NUMERICAL METHODS	CO 1 Understand the concept, properties and important models of discrete random variables and, using them, analyse suitable random phenomena. CO 2 Understand the concept, properties and important models of continuous random variables and, using them, analyse suitable random phenomena. CO 3 Perform statistical inferences concerning characteristics of a population based on attributes of samples drawn from the population CO 4 Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques CO 5 Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations.
33	MAT 204	PROBABILITY RANDOM PROCESSES AND NUMERICAL METHODS	CO 1 Understand the concept, properties and important models of discrete random variables and, using them, analyse suitable random phenomena. CO 2 Understand the concept, properties and important models of continuous random variables and, using them, analyse suitable random phenomena. CO 3 Analyse random processes using autocorrelation, power spectrum and

			Poisson process model as appropriate. CO 4 Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques CO 5 Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations
34	MAT 206	GRAPH THEORY	CO 1 Explain vertices and their properties, types of paths, classification of graphs and trees & their properties. (Cognitive Knowledge Level: Understand) CO 2 Demonstrate the fundamental theorems on Eulerian and Hamiltonian graphs. (Cognitive Knowledge Level: Understand) CO 3 Illustrate the working of Prim's and Kruskal's algorithms for finding minimum cost spanning tree and Dijkstra's and Floyd-Warshall algorithms for finding shortest paths. (Cognitive Knowledge Level: Apply) CO 4 Explain planar graphs, their properties and an application for planar graphs. (Cognitive Knowledge Level: Apply) CO 5 Illustrate how one can represent a graph in a computer. (Cognitive Knowledge Level: Apply) CO 6 Explain the Vertex Color problem in graphs and illustrate an example application for vertex coloring. (Cognitive Knowledge Level: Apply)
35	MAT 208	PROBABILITY STATISTICS AND ADVANCED GRAPH THEORY	CO 1 Understand the concept, properties and important models of discrete random variables and, using them, analyse suitable random phenomena. CO 2 Understand the concept, properties and important models of continuous random variables and, using them, analyse suitable random phenomena. CO 3 Perform statistical inferences concerning characteristics of a population based on attributes of samples drawn from the population CO 4 Understand the basic concept in Graph theory, Understand planar graphs and its properties. Demonstrate the knowledge of fundamental concepts of matrix representation of graphs, Apply