Estd: 1985

G Pulla Reddy Engineering College (Autonomous)

Nandyal Road, **KURNOOL – 518007.**

Affiliated to J.N.T. University, Anantapur, Ananthapuram

Programme: Computer Science and Engineering (CSE)

Course Outcomes: B.Tech CSE I to IV Years (Scheme 2020)

UG-CSE: I Year (Scheme-2020)		
Course Code	**Course Name**	**Course Outcomes**
BS101	ENGINEERING MATHEMATICS – I (EM1)	CO1: Find the solution for simultaneous system of linear equations and eigen values and eigen vectors.
		CO2: Solve first order differential equations and its applications.
		CO3: Solve higher order differential equations and its applications.
		CO4: Understand Rolle‟s and Lagrange‟s mean value theorems. Evaluate maxima & minima and areasand volumes by multiple integrals
		CO5: Learn Laplace transform of a function and solve the differential equations using Laplace
BS110	APPLIED PHYSICS (AP)	CO1:Understand the origin of magnetism, hysteresis, soft and hard magnetic materials; Dielectrics and their characteristics; superconductivity, types, characteristics, Meissner, Josephson effects.
		CO2:Understand the phenomenon of interference, diffraction of light and their applications.
		CO3:Understand the Production, detection, properties and applications of ultrasonic waves, determination of velocity of ultrasonic waves in liquids. Principles of quantum mechanics, Schrodinger‟s equation and its applications.
		CO4:Understand the theory and different production methods of lasers and their applications, different types of optical fibers, losses in fibers and applications of optical fibers.
		CO5:Understand the Properties, synthesis, applications of Nanomaterials and Carbon Nanotubes.
EE101	ELEMENTS OF ELECTRICAL ENGINEERING (EEE)	CO1: Understand the basic essentials of DC circuits.
		CO2: Understand the basic essentials of AC circuits.
		CO3: Understand the construction and working of DC machines.
		CO4: Understand the construction and working of transformers, induction motors and AC generators.
		CO5: Understand the basics of illumination and earthing.
EC101	ELECTRONIC DEVICES	CO1: Understand the concepts of energy band diagrams and semiconductors.
		CO2: Apply the concept of diode in rectifiers, filter circuits and wave

	AND CIRCUITS (EDC)	shaping.
		CO3: Analyze the operation and configurations of BJT.
		CO4: Analyze the operation and characteristics of JFET.
		CO5: Analyze the operation and characteristics of MOSFET and special devices.
CS101	PROGRAMMING FOR PROBLEM SOLVING (PPS)	CO1: Understand fundamentals of problem solving concepts with various data types and operators
		CO2: Apply conditional and iterative statements for solving a given problem
		CO3: Illustrate the applications of functions and storage classes.
		CO4 : Apply the concepts of pointers and dynamic memory management in problem solving.
		CO5: Understand the purpose of structures, unions and files.
BS114	APPLIED PHYSICS LAB (AP(P))	CO1:Apply the knowledge of physics laboratory in measuring the standard values.
		CO2:Apply theoretical knowledge to experimental values.
EC103	ELECTRONIC DEVICES AND CIRCUITS LAB (EDC (P))	CO1: Understand the operation of electronic equipments - CRO, CDS and FG.
		CO2: Analyze the characteristics and applications of PN-diode and Zener diode.
		CO3: Understand the characteristics of BJT.
		CO4: Understand the characteristics of JFET.
CS107	PROGRAMING FOR PROBLEM SOLVING LAB [PPS(P)]	CO1: Implement programs using conditional and loop statements in C.
		CO2: Develop programs using 1-Dimensional and 2-Dimensional arrays.
		CO3: Perform Call by value, Call by reference and Recursion through functions.
		CO4: Implement programs using pointers.
		CO5: Develop programs using structures and file concepts.
II SEMESTER		
BS104	ENGINEERING MATHEMATICS – II (EM2)	CO1: Utilize Numerical Methods and principles of least square methods in engineering problems.
		CO2: Determine the Fourier series of a function and its expansion.
		CO3: Understand the Fourier and Z-transforms.
		CO4: Use Partial differential equations and method of separation of variables in solving the one
		dimensional wave and Heat equations.
		CO5: Understand vector differentiation & integration and its applications.
BS106	PROBABILITY & STATISTICAL METHODS (PSM)	CO1: Gain the knowledge on Mathematical Statistics and probability theory.
		CO2: Classify discrete and continuous distributions.
		CO3: Understand the test of hypothesis for large samples.
		CO4: Analyze the Test of significance for small samples.
		CO5: Find correlation coefficient and classification of ANOVA.
HU101	ENGLISH (ENG)	CO 1: Use Grammatically acceptable English in Oral and Written communication.
		CO 2: Use appropriate Vocabulary in Technical and General Contexts.
		CO 3: Comprehend General and Technical Content using various Reading Skills like Skimming and Scanning.

		CO 4: Write Letters, Summaries and Essays of topical, Narrative, Descriptive, Analytical and Persuasive nature.
		CO 5: Write Job Applications, Resumes, Memos and E-mails.
ME101	ENGINEERING DRAWING (ED)	CO1: Understand the concept of projections of an object and draw the projection of points, straight lines and planes
		CO2: Draw projection of regular solids
		CO3: Draw the sectional views of regular solids and their surface developments
		CO4: Draw the orthographic views from given isometric view
		CO5: Draw the isometric views from the orthographic views
CS104	DATA STRUCTURES (DS)	CO1: Understand the purpose of array data structure and its applications
		CO2: Understand the linked list data structure and its operations.
		CO3: Illustrate the operations performed on stack data structure.
		CO4: Illustrate the operations performed on queue data structure
		CO5: Understand the concepts of trees and operations on binary search trees.
MC101	ENVIRONMENTAL STUDIES (ES)	CO1: Apply the knowledge of environmental issues in his area of work. Understands the need for the conservation of Natural resources for sustainable development.
		CO2: Understands the importance of Ecosystem and conservation of biodiversity
		CO3: Understands the problems due to environmental pollution with remedial measures and issues related to environment.
		CO4: Understands the disaster management in prevention of loss of life and property
		CO5: Understands the use of IT & related technology to conserve environment & human health.
BS112	STATISTICAL METHODS LAB (SM(P))	CO1: Implement the basic data types and flow control statements in R Language.
		CO2: Implement functions, matrices and vectors.
		CO3: Apply different file operations and statistical methods for data analysis.
		CO4: Implement various visualization techniques
HU103	PHONETICS & COMMUNICATION SKILLS LAB (PCSP)	CO1: Speak Internationally Intelligible English without mother tongue accent.
		CO2: Adopt appropriate intonation patterns for effective Oral Communication.
		CO3: Identify International Phonetic Symbols to find the pronunciation of new words.
		CO4: Integrate Listening Skills & Speak in English confidently, fluently and effectively.
		CO5: Exhibit team playing & Leadership skills.
CS109	DATA STRUCTURES LAB (DS(P))	CO1: Implement the operations on array data structure.
		CO2: Implementation of searching and sorting techniques.
		CO3: Implement Stacks using static and dynamic allocation.
		CO4: Implement Queues using static and dynamic allocation.
UG-CSE: II Year (Scheme-2020)		
HU201	MANAGERIAL ECONOMICS & FINANCIAL	CO1: Understand the nature and scope of managerial economics and the concepts of demand analysis.
		CO2: Understand the significance of demand elasticity and the concepts of demand forecasting.
		CO3: Understand the concepts of production and cost analysis and

	ACCOUNTANCY (MEFA)	different market structures and their
		competitive situations.
		CO4: Understand the concept and significance of capital budgeting.
		CO5: Understand the principles and significance of accountancy and preparation of final accounts.
CS201	SWITCHING THEORY & LOGIC DESIGN (STLD)	CO1: Understand number conversions, Error detection and correction mechanisms.
		CO2: Apply axioms and theorems of Boolean Algebra for minimization of Boolean functions.
		CO3: Apply Karnaugh map and Tabulation method to obtain minimal SOP and POS.
		CO4: Implement combinational circuits: Encoders, Decoders, Multiplexers, ROM, PLA.
		CO5: Design Sequential circuits using Flip-flops and sequential logic.
		CO6: Design registers and counters.
CS202	ADVANCED DATA STRUCTURES (ADS)	CO1: Illustrate the applications of Linked Lists, Stacks and Queues.
		CO2: Comprehend the operations performed on Binary Search Tree and AVL Tree.
		CO3: Understand Heap Operations and Applications.
		CO4: Organize the data using Hashing Techniques for efficient Searching.
		CO5: Understand Operations on Special Trees and String searching algorithms.
CS203	DATABASE SYSTEMS (DBS)	CO1: Understand the concepts of Database Management Systems and Entity Relationship Modeling.
		CO2: Use SQL commands to create, retrieve, update, and delete data from the Data bases.
		CO3: Comprehend the concepts of Normalization techniques and Indexing.
		CO4: Understand the properties of Transactions in a Database System.
		CO5: Understand Concurrency Control techniques and Recovery System.
CS204	OBJECT ORIENTED PROGRAMMING THROUGH JAVA (OOPJ)	CO1: Understand Object Oriented Programming concepts.
		CO2: Demonstrate the concepts of Inheritance, Packages and Interfaces.
		CO3: Understand String handling methods and Exception handling mechanism.
		CO4: Comprehend Multithreading and Java Data Base Connectivity.
		CO5: Understand Collection interfaces and Collection classes.
MC201	CONSTITUTION OF INDIA (CI)	CO1: Understand the formation and principles of Indian Constitution.
		CO2: Understand structure and functions of Union government and State executive. Duties of President, Vice president, Prime Minister, Governor, Chief Minister cabinet and State Legislature.
		CO3: Understand constitutional amendments of 42, 44,74,76,86 and 91. Central-State relations, President rule.
		CO4: Understand Indian social structure and languages in India. Rights of women, SC, ST and then weaker section.
		CO5: Understand the structure of Judiciary, Role and functions of Supreme Court, High court and Subordinate courts, Judicial review.
CS205	ADVANCED DATA	CO1: Implement the applications of Linked lists, Stacks and Queues.
		CO2: Implement Binary Search Tree and AVL Tree operations.

	STRUCTURES LAB (ADS(P))	CO3: Implement Hashing Techniques.
		CO4: Implement String searching algorithms.
CS206	DATABASE SYSTEMS LAB (DBS (P))	CO1: Design Entity Relationship diagrams and Schema diagrams for real life systems.
		CO2: Implement SQL queries on the real-life systems.
		CO3: Write PL/SQL programs for given problems.
		CO4: Implement Procedures, Functions, Triggers and Cursors in PL/SQL.
CS207	OBJECT ORIENTED PROGRAMING THROUGH JAVA LAB (OOPJ(P))	CO1: Implement Method overloading and Constructor overloading.
		CO2: Implement Inheritance, Packages and Interfaces concepts.
		CO3: Implement String handling and Exception handling.
		CO4: Implement multithreading and collections.
SCCM01	SOFT SKILLS LAB (SS(P))	CO1: Communicate effectively and enhance their interpersonal relationship building skills with renewed self confidence
		CO2: Work together in teams and accomplish objectives in a cordial atmosphere
		CO3: Face interviews, GDs and give presentations
		CO4: Understand and develop the etiquette necessary to present themselves in a professional setting
		CO5: Learn the Principles of Personal effectiveness
IV SEMESTER		
CS208	OPERATING SYSTEMS (OS)	CO1: Acquaint with the basics of the Operating System and their different structures.
		CO2: Comprehend the process management policies, CPU Scheduling and Process synchronization
		techniques
		CO3: Understand Deadlocks and their Handling mechanisms, file management system.
		CO4: Analyze memory management schemes and allocation policies.
		CO5: Demonstrate Input / Output related Software/Hardware and Disk scheduling strategies.
CS209	SOFTWARE ENGINEERING & APPLICATIONS (SEA)	CO1: Identify the key activities in managing a software project and Process Models.
		CO2: Understand the components of Software Requirements Specification document.
		CO3: Apply systematic procedure for software design and deployment.
		CO4: Understand the testing strategies to build the test cases.
		CO5: Estimate project risks and project metrics.
CS210	COMPUTER ORGANIZATION(CO)	CO1: Understand the design of a basic computer.
		CO2: Acquire the concepts of basic programming, design of Micro Programmed
		control unit
		CO3: Understand the Internal working of CPU, Pipelining and Vector Processing
		CO4: Illustrate the basic Computer Arithmetic operations, Input Output Organization
		CO5: Understand the concepts of Memory system and Secondary Storage devices
CS2	DESIGN	CO1: Analyze the performance of algorithms.

11	AND ANALYSIS OF ALGORITHMS (DAA)	CO2:.Comprehend Divide and conquer technique to solve problems.
		CO3: Apply Greedy method to solve problems.
		CO4: Apply Dynamic programming technique to solve problems.
		CO5: Understand Tree traversal, Graph traversal and Backtracking techniques.
		CO6: Understand Branch and Bound technique and Lower bound theory.
CS212	DISCRETE STRUCTURES (DSS)	CO1: Understand the mathematical representation of statements using connectives, normal forms,
		equivalence and implications.
		CO2: Calculate number of possible outcomes of elementary combinatorial processes.
		CO3: Solve homogenous and Inhomogeneous recurrence relations using substitution method and
		generating functions
		CO4: Understand the concept of Planar graphs, Hamiltonian graphs, Euler graphs, Spanning trees and
		Binary trees.
		CO5: Understand the association between the elements of sets using Digraphs and Warshall's
		Algorithm.
SCCS01	PYTHON PROGRAMMING (PYP)	CO1: Understand the python programming constructs, operators and expressions.
		CO2: Apply the concepts of functions, decision and control structures to solve problems.
		CO3: Apply the core data structures String, List, Tuple, Set and Dictionaries to solve problems.
		CO4: Understand file operations, exception handling and modules.
		CO5: Apply Object Oriented Programming concepts to solve real life problems.
CS213	OPERATING SYSTEMS LAB (OS(P))	CO1: Understand the Unix commands and vi editor.
		CO2: Implement threads and scheduling concepts.
		CO3: Implement inter-process communication, deadlock avoidance and deadlock detection.
		CO4: Implement the shared memory concepts.
		CO5: Implement the memory management techniques.
CS214	SOFTWARE ENGINEERING & APPLICATIONS LAB (SEA(P))	CO1: Identify suitable software development process model for a given scenario
		CO2: Create a UML diagrams for a specified problem
		CO3: Apply testing methodologies for validating design models
CS215	DESIGN AND ANALYSIS OF ALGORITHMS LAB (DAA(P))	CO1: Apply Divide and Conquer and Greedy methods for problem solving.
		CO2: Apply Dynamic Programming Technique to solve problems.
		CO3: Apply Backtracking and Branch and Bound Techniques for problem solving.
UG-CSE: III Year (Scheme-2020)		
CS301	DATA COMMUNI	CO1:Understand Data Communication Systems, Network models and its Protocols

	CATION AND COMPUTER NETWORKS (DCCN)	CO2: Understand concepts of Transmission media and techniques of Data link layer.
		CO3: Understand the routing strategies for an IP based networking infrastructure.
		CO4: Study of congestion control and internetworking concepts.
		CO5: Understand connection establishment and services provided by TCP and UDP
CS302	FORMAL LANGUAGES AND AUTOMATA THEORY (FLAT)	CO1: Design the finite automata for a given regular language.
		CO2: Understand the regular expressions and pumping lemma of regular languages.
		CO3: Understand the regular grammar, Context Free Grammar and pumping lemma for CFL.
		CO4: Design push down automata and context free grammar for a given context free language.
		CO5: Design the Turing Machine for the given formal language.
CS303	ARTIFICIAL INTELLIGENCE (AI)	CO1: Understand the fundamental concepts of Artificial Intelligence.
		CO2:Solve problems by applying suitable search method.
		CO3:Solve problems by applying heuristic search method.
		CO4:Understand constraint satisfaction problems.
		CO5:Understand the Knowledge Representation techniques.
CS312	Advanced Computer Architecture(PE-1)	CO1: Understand the concept of parallel processing, classification schemes and memory addressing schemes in parallel processing systems.
		CO2: Apply the concept of Pipelining in function evaluation using reservation table.
		CO3: Understand the principles of pipelining in designing pipeline processors.
		CO4: Understand the SIMD array structures, algorithms for array processors and SIMD Interconnection networks.
		CO5: Understand the characteristics of multiprocessor systems, interconnection networks and the importance of data flow computers over control flow computers.
CS313	OBJECT ORIENTED ANALYSIS AND DESIGN (OOAD)(PE-1)	CO1: Understand the importance of model, UML and Class diagrams.
		CO2: Describe the structural and behavioralmodeling of a software system.
		CO3: Design an event driven system with dynamic dimensions.
		CO4: Design logical elements of a system.
		CO5: Construct an architectural template for applications and deployment diagrams.
CS314	INFORMATION RETRIEVAL SYSTEM (IRS)(PE-1)	CO1: Ability to apply IR principles to locate relevant information large collections of data.
		CO2: Ability to design different document clustering algorithms.
		CO3: Implement retrieval systems for web search tasks.
		CO4: Design an Information Retrieval System for web search tasks.
		CO5: To understand the concepts of multimedia information retrieval.
CS315	SOFT COMPUTING (SC)(PE-1)	CO1: Analyze various neural network architectures and learning models.
		CO2: Design associative memory networks and unsupervised learning networks.
		CO3: Define the fuzzy logic and sets.
		CO4: Study of membership functions and fuzzy arithmetic operations.
		CO5: Understand genetic algorithm concepts and their applications.

OEC 301	OPTIMIZATIONTECHNIQUES (OT)(OE-1)	CO1: Understand the concepts of Optimization and solve linear programming problems
		CO2: Solve the engineering problems using Integer programming technique
		CO3: Solve the engineering problems using Kuhn tucker conditions and Lagrangean multiplier method
		CO4: Solve the engineering problems using dynamic programming technique
		CO5: Apply non-traditional optimization techniques to solve engineering problems.
OEC 302	REMOTE SENSING & GIS (RSGIS)(OE-1)	CO1: Understand the Photogrammetry, EDM and Total station surveying principles to solve
		surveying problems using appropriate tools and techniques.
		CO2: Understand the concepts of remote sensing and interpretation methods.
		CO3: Understand the importance of maps, concept of map projections.
		CO4: Understand the concept of GIS and its applications, different data models, spatial
		analysis.
		CO5: Understand the principles used in GNSS and Drone surveying, data collection
		methods, error in observations and corrections.
OEC 303	INTRODUCTION TO JAVA (ITJ)(OE-1)	CO1: Understand fundamentals of oops concepts, input and output
		CO2: Understand the classes and objects.
		CO3: Understand the Inheritance and interfaces
		CO4: Understand the string handling methods
		CO5: Understand the exception handling
OEC 304	INTERNET OF THINGS (IoT)(OE-1)	CO1: Understand the basic knowledge of Internet of things and its design
		CO2: Understand the purpose of sensors and Actuators in IoT
		CO3: Analyze Various IoT Protocols
		CO4: Design IoT Projects Using Arduino
		CO5: Understand Raspberry-Pi Processor and Raspbian Operating Systems
OEC 305	SCIENTIFIC PROGRAMMING WITH PYTHON (SPY)(OE-1)	CO1: Understand programming with mathematical formulas.
		CO2: Apply the concepts of Loops, lists, Functions and Branching.
		CO3: Work with Input, Error Handling and Modules.
		CO4: Learn to visualize mathematical functions and mathematical calculations.
		CO5: Work on Dictionaries and Strings.
		CO6: Apply the concepts of Object Oriented Programming.
OEC 306	INTRODUTION TO DATABASE SYSTEMS (IDBS)(OE-1)	CO1: Understand the concepts of Database Management Systems and Entity Relationship Modelling.
		CO2: Use SQL commands to create, retrieve, update, and delete data from the Data base.
		CO3: Comprehend the concepts of Normalization techniques
		CO4: Understand the properties of Transactions in a Database System.
		CO5: Understand Concurrency Control techniques and Recovery System.
OEC	ETHICAL	CO1: Understand the basics of security and ethical hacking.

307	HACKING (EH)(OE-1)	CO2: Understand about foot printing and types of attacks in social engineering.
		CO3: Understand about sniffers, hijacking and DoS attacks.
		CO4: Understand the importance of web server hacking, database hacking and SQL Injection.
		CO5: Understand about Wireless technologies, intrusion detection and firewalls.
OEC 308	ENTREPRENEURSHIP DEVELOPMENT (EDP)(OE-1)	CO1:Analyse the role of entrepreneurship in economic development
		CO2:Understand rural entrepreneurship and small enterprises
		CO3:Examine the project reports
		CO4:Understand the ownership structure of company and women entrepreneurship in
		India
		CO5:Understand the support by specified institutions for entrepreneurship development
OEC 309	INTRODUCTION TO INFORMATION SYSTEMS (IIS)(OE-1)	CO1: Understand the concepts of Computer architecture and functionalities of System Software.
		CO2: Understand the page replacement and CPU Scheduling Algorithms
		CO3: Understand the phases of software development life cycle and process models.
		CO4: Design ER model for real life scenarios
		CO5: Apply SQL commands to create, update, modify and retrieve data from the data bases.
		CO6: Apply normalization techniques to normalize the database
OEC 310	NEURAL NETWORKS AND FUZZY LOGIC (NNFL)(OE-1)	CO1: understand the basic concepts of Neural networks
		CO2: analyze Supervised Learning feedback networks
		CO3: analyze Unsupervised Learning feedback networks.
		CO4: understand concepts of fuzzy logic and fuzzy set theory
		CO5: To apply the knowledge of Neural Networks & fuzzy logic to real time systems.
MC104	PROFESSIONAL ETHICS (PE)	CO1: Understand the importance of Ethics & Human Values and become Humane.
		CO2: Know the moral autonomy and uses of Ethical theories.
		CO 3: Know the responsibilities of the Engineer towards the society.
		CO 4: Assess environmental issues to take Protective measures to evade risks.
		CO 5: Determine various roles of Engineer and help them make the world a better place.
CS304	DATA COMMUNICATION AND COMPUTER NETWORKS LAB (DCCN (P))	CO1: Understand the network models using packet tracer.
		CO2: Implement the error detection, routing and congestion techniques.
		CO3: Implement real time applications.
CS305	ARTIFICIAL INTELLIGENCE LAB (AI(P))	CO1: Implement searching strategies BFS, DFS.
		CO2: Demonstrate the adversarial search techniques.
		CO3: Demonstrate the Constraint satisfaction problem.
		CO4: Design the use cases for knowledge representation techniques.
SCC	MULTIMED	CO1: Design the web based multimedia components

S02	IA AND APPLICATIONS LAB (MAA (P))	CO2: Create time-based and interactive multimedia components.
		CO3: Create Animation Projects from its Conceptual Stage to the final Product.
		CO4: Apply Audio and Video Production Techniques to an Animation Project.
VI SEMESTER		
CS306	COMPILER DESIGN (CD)	CO1: Understand the phases of compiler and lexical analyzer.
		CO2: Construct the parse trees using Top down and bottom up parsing methods.
		CO3: Build a type system, syntax directed translation and symbol table.
		CO4: Develop intermediate code generation and code optimization techniques.
		CO5: Understand target code generation using flow graph and DAG representation Three address code.
CS307	BIG DATA TECHNOLOGIES (BDT)	CO1: Understand the basics of Big Data Analytics, Hadoop.
		CO2: Design Map Reduce programs for a given problem.
		CO3: Write Pig Scripts on Hadoop that works on large datasets.
		CO4: Perform Data Querying Operations using Apache Hive.
		CO5: Implement Data Management using NoSQL Databases
CS308	FOUNDATIONS OF MACHINE LEARNING (ML)	CO1: Understand machine learning systems and data preprocessing techniques
		CO2: Analyze performance measures of a Digit Image Classifier
		CO3: Understand the concepts of Linear regression and regularization.
		CO4: Understand the core concepts and working of Support Vector Machines, Decision trees.
		CO5: Illustrate Ensemble methods and Unsupervised Learning algorithms
EC320	MICROPROCESSORS AND MICROCONTROLLERS (MMC)	CO1: Understand the pin structure, architecture of 8086 microprocessor.
		CO2: Understand the operations and internal block description l of 8086 microprocessor.
		CO3: Apply the programming model of 8086 microprocessor for Assembly language programs.
		CO4: Understand the pin structure, architecture and operations of 8051 microcontroller.
		CO5: Apply the programming model of 8051 micrcontroller for Assembly language programs.
CS316	EMBEDDED SYSTEMS (EBS)(PE-2)	CO1: Provides general overview of Embedded Systems
		CO2: Show current statistics of embedded systems.
		CO3: Design, Code, Compile, and test real time software.
		CO4: Understand the RTOS Environment
		CO5: Integrate a fully functional system including hardware and software.
CS317	DISTRIBUTED SYSTEMS (DS)(PE-2)	CO1: Understand the models and design requirements of distributed systems.
		CO2: Describe Client Server Model, Communication Methods of Distributed System
		CO3: Classify Clock Synchronization, Mutual Exclusion, Deadlocks in Distributed System
		CO4: Summarize the concepts of Threads, Processor Allocation Algorithms
		CO5: Understand Distributed File System Design with

		Implementation.
CS318	PATTERN RECOGNITION (PR)(PE-2)	CO1: Understand supervised and unsupervised classification methods for pattern recognition.
		CO2: Understand the different clustering techniques.
		CO3: Understand the structural pattern recognition models.
		CO4: Interpret feature extraction and subset selection methods
		CO5: Implement the neural networks for pattern recognition problems.
CS319	SOFTWARE PROJECT MANAGEMENT (SPM)(PE-2)	CO1: Define the purpose of project management and programme management.
		CO2: Discuss project planning and process models.
		CO3: Estimate effort of software project using effort estimation techniques.
		CO4: Describe risk categories and steps to monitor, control the project.
		CO5: Understand the importance of team work and software quality.
OEC 311	RENEWABLE ENERGY SOURCES (RES)(OE-2)	CO1:Understand various sources of energy and solar geometry.
		CO2:Describe the process of harnessing solar energy in the form of heat.
		CO3:Explore basic terms of wind and the extraction of energy from wind.
		CO4:Understand the technologies involved in extraction o f biomass
		energy and geothermal Energy.
		CO5:Understand Tidal, Wave and Ocean energy conversion methods and concepts of emerging technologies.
OEC 312	INDUSTRIAL SAFETY (IS)(OE-2)	CO1:To understand the principles of safety management including safety audit, safety education and accident investigation
		CO2:To understand the causes and implication of fire and explosion and the preventive measures
		CO3:To understand machine and construction safety assessment and safeguarding methods
		CO4:To understand the effect of toxic substances and hazardous chemicals
		CO5:To understand the modes of electrical hazards and safety measures in electrical and information
		technology industries
OEC 313	WEB TECHNOLOGIES (WT)(OE-2)	CO1: Design a Web Page using Text Formatting Tags, Hyperlinks
		CO2: Develop a webpage with Images, Tables Hyperlinks, Lists, CSS.
		CO3: Design dynamic web pages using JavaScript
		CO4: Design a Form using HTML Forms & Controls
		CO5: Understand the basic concepts of PHP and database connection using XAMPP Server.
OE314	INTRODUCTION TO CYBER SECURITY (ICS)(OE-2)	CO1: Discriminate and analyze the problems in cybercrime.
		CO2: Identifying different classes of attacks.
		CO3: Synthesize cybercrime issues on wireless and mobile devices.
		CO4: Use and apply modern cyber forensics tools.
		CO5: Analyze the computer forensic problems for feasible solutions.
OEC 315	NANO TECHNOLOGY (NNT)(OE-2)	CO1: Understand the principles behind nanotechnology and nanomaterials
		CO2: Analyze the fabrication, characterization, and manipulation of nanomaterials,
		CO3: Understand about metal nano particle based sensors

		CO4: Analyze about nano wire based sensors.
		CO5: Understand Sensors Based on Nanostructures of Metal Oxides
OEC 316	DISASTER MANAGEMENT (DM)(OE-2)	CO1: Understand the definitions and terminologies used in disaster management.
		CO2: Understand the types and categories of disasters.
		CO3: Understand the impact of disasters on socio-economic and environment.
		CO4: Plan for disaster risk reduction, mitigation and management strategies.
		CO5: Understand the relationship between development and disasters.
OEC 317	PROJECT MANAGEMENT (PM)(OE-2)	CO1: Understand the methods of planning, scheduling and principles of construction
		management.
		CO2: Formulate, solve CPM and PERT networks.
		CO3: Understand the structure of organization and resource allocation.
		CO4: Understand the procedure for documentation of tenders, contracts & time-cost analysis.
		CO5: Understand basics of engineering economics and solving of cash flow problems.
		CO6: Understand the concepts of quality control and safety management.
OEC 318	ADVANCED INFORMATION SYSTEMS (AIS)(OE-2)	CO1: Demonstrate the Object oriented concepts.
		CO2: Interpret different types of Inheritance and Polymorphism.
		CO3: Classify layer functionalities of OSI reference model and TCP Protocol suite.
		CO4: Summarize the concepts of internetworking, security and IP addressing.
		CO5: Demonstrate different types of protocols and web contents used in web design
OEC 319	PRODUCT LIFE CYCLE MANAGEMENT (PLM)(OE-2)	CO1: Understand Product life cycle management process.
		CO2: Understand different steps in Product development process.
		CO3: Get knowledge on Product data management
		CO4: Understand the implementation of PLM and its impact on the organization
		CO5: Understand core functions of PLM and supply chain and ERP systems
OE320	INDUSTRY 4.0 (I40)(OE-2)	CO1: Understand the Characteristics, Sensors, Actuators and Communication models for industry 4.0.
		CO2: Understand Fourth revolution and Industry operations.
		CO3: Understand the Cyber-Physical Systems, Sensors, platforms of Industrial IoT.
		CO4: Understand the Cyber security, Industrial Internet Systems.
		CO5: Understand Business Models and Architecture, Key enablers in Industrial IoT.
MC105	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE (EITK)	CO1: Understand the concept of Traditional knowledge and its importance.
		CO2: Explain the need and importance of protecting traditional knowledge.
		CO 3: Illustrate the various enactments related to the protection of traditional knowledge.
		CO 4: Interpret the concepts of Intellectual property to protect the traditional knowledge.

		CO 5: Understand the traditional knowledge in different sectors.
CS309	COMPILER DESIGN LAB (CD(P))	CO1: Implement DFA and Lexical Analyzer.
		CO2: Construct parse trees using Top down and Bottom up parsing methods.
		CO3: Implement Intermediate code generation.
CS310	BIG DATA TECHNOLOGIES LAB (BDT(P))	CO1: Demonstrate Hadoop Commands in Ubuntu environment.
		CO2: Design Map Reduce Programs to different problems.
		CO3: Implement Pig on Hadoop Framework and perform basic operations.
		CO4: Perform DDL operations using Hive on Hadoop.
CS311	MACHINE LEARNING LAB (ML(P))	CO1:Apply Data Preprocessing techniques using Numpy and Pandas
		CO2:Build binary classifier on Image Dataset
		CO3:Implement Classification and Regression Models
		CO4:Apply Ensemble Learning and Clustering techniques
SCCS03	ANDROID APP DEVELOPMENT LAB(AAD(P))	CO1: Install and configure Android application development tools.
		CO2: Design and develop user Interfaces for the Android platform.
		CO3:. Save state information across important operating system events.
		CO4: Apply Java programming concepts to Android application development.
UG-CSE: IV Year (Scheme-2020)		
CS401	ADHOC AND SENSOR NETWORKS (ASN)(PE-3)	CO1: Explain the concepts, network architectures and applications of ad hoc and wireless
		Sensor networks.
		CO2: Describe MAC protocols of ad hoc wireless networks.
		CO3: Explain characteristics, design issues and classification of routing and transport layer protocols
		in ad hoc wireless networks.
		CO4: Summarize the architecture of WSN along with MAC protocols for WSNs.
		CO5: Understand routing issues, localization and QoS in WSN.
CS402	SERVICE ORIENTED ARCHITECTURE (SOA)(PE-3)	CO1: Understand software oriented architectures.
		CO2: Design medium scale software project development using SOA principles.
		CO3: Develop SOA messages from business use cases.
		CO4: Design and implementation of modern SOA and SOA-specific methodologies, technologies and
		standards.
		CO5: Create composite services by applying composition style.
CS403	MOBILE COMMUNICATIONS (MC)(PE-3)	CO1: Understand the basic concepts of wireless communication & mobile computing.
		CO2: Understand the wireless medium access controlling mechanisms and GSM.
		CO3: Understand the WLAN System Architecture, Protocol Architecture, And Physical Layer.
		CO4: Acquiring knowledge on the structure & concepts of Mobile IP.
		CO5: Understand the Traditional TCP and Classical Improvements of TCP.
CS404	NETWORK SECURITY AND	CO1: Understand the concepts and principles of Network Security.
		CO2: Analyze various classical encryption techniques and block cipher structure.

	CRYPTOGRAPHY (NSC)(PE-3)	CO3: Analyze advanced encryption standard.
		CO4: Understand block cipher modes of operation.
		CO5: Explain various asymmetric ciphers
		CO6: Understand cryptographic hash functions and digital signatures
CS405	SOFTWARE QUALITY AND TESTING (SQT)(PE-4)	CO1: Understand the basic concepts of software testing.
		CO2: Classify the types of software testing to point out the importance of testing in achieving
		high-quality software.
		CO3: Understand the various testing techniques of a software system.
		CO4: Compare the traditional software testing and web based testing.
		CO5: Extend the Quality concepts and Metrics for the Software Quality.
CS406	QUANTUM COMPUTING (QC)(PE-4)	CO1: Understand the Quantum Computation
		CO2: Understand the Framework of Quantum Mechanics
		CO3: Understand Deutsch Algorithm
		CO4: Understand Amplitude Amplification
		CO5: Implement Error Correction Codes
CS407	DEEP LEARNING (DLE)(PE-4)	CO1: Understand concept of deep learning and Artificial Neural Network.
		CO2: Summarize the Deep Neural Nets.
		CO3: Understand the Convolutional Neural Networks Operations.
		CO4: Understand the different types of Convolutional Neural Networks Architectures.
		CO5: Understand the Recurrent Neural Networks and deep RNN training.
CS408	PARALLEL AND DISTRIBUTED ALGORITHMS(PE-4)	CO1: Understand Parallel Algorithms
		CO2: Study the complexity correctness models for parallel algorithms.
		CO3: Understand PRAM and Shared Memory Algorithms.
		CO4 :Understand Distributed Algorithms
		CO5: Understand classical algorithms .
CS409	HIGH PERFORMANCE COMPUTING (HPC)(PE-5)	CO1: Understand the limitations, control structure and communication models of parallel computer
		systems.
		CO2: Summarize the decomposition techniques and mapping techniques for parallelalgorithms.
		CO3: Understand One-to-all, all-to-one and all-to-all communication operations for parallel computers.
		CO4: Interpret the programming techniques using message passing paradigm.
		CO5: Understand the thread programming for shared address space platforms using Open MP.
CS410	CLOUD COMPUTING(CC)(PE-5)	CO1: Understandthe features, layers and types of clouds.
		CO2: Understand the Virtual Machine Provisioning and Migration Services in cloud
		CO3: Understand the Aneka Cloud Architecture and Hybrid Cloud Architecture.
		CO4: Understand the cloud features implemented in Google, Microsoft, Amazon andSalesForce.com
		CO5: Understand the Cloud Applications, Best Practices and Future of Cloud.
CS4	IMAGE &	CO1: To provide the basic understanding of the digital image

11	VIDEO PROCESSING (IVP)(PE-5)	formation and visualization.
		CO2: Apply various image enhancement techniques both in spatial and frequency domain.
		CO3: Understand image compression models and different types of compression techniques
		CO4: Perform Image segmentation on real time images.
		CO5: Understand the principles of Video imaging and Video display
CS412	DIGITAL FORENSICS (DF)(PE-5)	CO1: Understand the fundamental concepts of digital forensic, digital evidence and the incident
		response process.
		CO2: Apply various data acquisition techniques and tools on the evidences.
		CO3: Learn the methods applicable for different forensic investigations.
		CO4: Usage of various forensic tools to analyse different forensics data.
		CO5: Gains knowledge on cloud forensic procedures and challenges.
		CO6: Understand the concept of file system and their use in forensic analysis.
OEC 401	MULTIMODAL TRANSPORTATION ENGINEERING (MTE)(OE-3)	CO1: the components of urban and rural roads and estimates the capacity and level of service
		CO2: the components and functions of railway track
		CO3: the control factors, gradients and geometric design of railway track
		CO4: the various aircraft characteristics and design of runways
		CO5: the various features in Harbours and Ports, their construction and coastal protection
		works
OEC 402	AIR POLLUTION AND CONTROL (APC)(OE-3)	CO1: To take up the basic concepts of air pollution.
		CO2: To introduce students to basic concepts of pollution.
		CO3: The contents involved the knowledge of causes of air pollution.
		CO4: The contents involved the knowledge of health related to air pollution.
		CO5: To develop skills relevant to control of air pollution.
OEC 403	INDUSTRIAL ROBOTICS (IRT)(OE-3)	CO1: Understand the basic components of industrial robots.
		CO2: Understand the types of End Effectors and Sensors in robots.
		CO3: Understand the Robot manipulator, forward and inverse kinematics.
		CO4: Understand the programming methods for robots and design considerations of Robot work cell
		CO5: Understand the manufacturing and processing applications of robot.
OEC 404	QUALITY & RELIABILITY ENGINEERING (QRE)(OE-3)	CO1 : Understand the overview of the Total Quality Management system
		CO2: Understand concepts of customer satisfaction and employee involvement
		Apply the appropriate tools and techniques of continuous process improvement
		CO3: for controlling and improving quality
		Apply Quality Function Deployment and Bench Marking process for improving
		CO4: a product or process
		CO5: Understand concept of Reliability Engineering

OEC 405	SMART GRID TECHNOLOGIES (SGT)(OE-3)	CO1: Understand the basic concepts, components and architecture of smart grid.
		CO2: Understand the various measurement technologies in smart grid.
		CO3: Understand about battery technology and energy storage in smart grid.
		CO4: Understand the Interoperability and control of power grid.
		CO5: Understand the cyber security issues in smart grid.
OEC 406	ARTIFICIAL INTELLIGENCE & MACHINE LEARNING (AI & ML)(OE-3)	CO1:.Recognize how foundations laid for Artificial Intelligence
		CO2: Analyze the search strategies to find solutions to the problems by systematically generating new states
		CO3: Understand the machine learning concepts and the main steps in a typical machine learning
		CO4: Design a digit image classifier on MNIST dataset
		CO5: Analyze various ML training models
OEC 407	DISTRIBUTED EMBEDDED SYSTEMS (DES)(OE-3)	CO1: Understand the real time environment and applications.
		CO2: Understand System architecture and design of Distributed Embedded Systems
		CO3: Understand inter task management and scheduling.
		CO4: Analyze the network connection of distributed systems
		CO5: Analyze the working of multiple embedded devices in a distributed network
OEC 408	NATURAL LANGUAGE PROCESSING (NLP)(OE-3)	CO1: Understand the importance of Text Wrangling, Cleansing and POS tagging.
		CO2: Develop a NLP application using the NLTK library.
		CO3: Implement Text classification algorithms using scikit-learn and NLTK.
		CO4: Understand the basics of Tokenizing text using WordNet.
		CO5: Understand the importance of Text feature extraction process.
OEC 409	DESIGN THINKING (DTH)(OE-3)	CO1: Recognize the importance of Design Thinking
		CO2: Identify the steps in Design Thinking process
		CO3: Identify the difference between creativity and innovation
		CO4 : Evaluate the value of creativity
		CO5: Formulate specific problem statements of real time issues
OEC 410	CLOUD, MICRO SERVICES & APPLICATION (CMSA)(OE-3)	CO1: Demonstrate the main concepts of cloud, its characteristics, advantages, key technologies and its various delivery and deployment models.
		CO2: Develop and design an application using various tools in cloud environment.
		CO3:Acquire the basic and important design concepts an disuse of web application development techniques in cloud
		CO4: Structure simple python program for developing an application in cloud.
		CO5:Analyze the issue of cloud such as security, energy efficiency and interoperability, and provide an insight into future prospects of computing in the cloud monitoring.
OEC 411	BLOCK CHAIN TECHNOLOGIES (BCT)(OE-3)	CO1: Understand the basic concepts of Blockchain technology.
		CO2: Interpret the security and risks involved in Blockchain applications.
		CO3: Interpret the types of Blockchain applications and Blockchain solutions.
		CO4: Understand the process of EthereumBlockchain Implementation

		CO5: Understand the process of Hyper ledger Blockchain Implementation
OEC 412	AGILE METHODOLOGIES (AM)(OE-3)	CO1: Understand the importance of interacting with business stakeholders in determining the
		requirements for a software system
		CO2: Analyze iterative software development processes: how to plan them, how to execute them.
		CO3: Identify the impact of social aspects on software development success.
		CO4: Understand Software process improvement as an ongoing task for development teams.
		CO5: Analyze the Agile Metrics and Quality Assurance Activities
OEC 413	AUGMENTED REALITY & VIRTUAL REALITY (ARVR)(OE-3)	CO1: Explore the history of spatial computing and design interactions
		CO2: Understand the foundational principles describing how hardware, computer vision algorithms
		function .
		CO3: Learn Virtual reality animation and 3D Art optimization.
		CO4: Demonstrate Virtual reality
		CO5: Introduce to the design of visualization tools
OEC 414	COMPOSITE MATERIALS (CM)(OE-4)	CO1: Identify the properties of fiber and matrix materials used in commercial composites, and its manufacturing techniques.
		CO2: Understand manufacturing methods and their elastic properties of lamina.
		CO3: Analyze the Hooke's law for different type of materials.
		CO4: Understand the elastic behavior of the unidirectional composite
		CO5: Analyze a laminated plate in bending, including finding laminate properties from
		lamina.
OEC 415	IMAGE PROCESSING (IP)(OE-4)	CO1:Understand the concepts of image processing system and various operations that can perform on
		digital images.
		CO2: Understand the image enhancement in spatial and frequency domain.
		CO3: Understand various image restoration techniques.
		CO4: Understand various image compression and segmentation techniques.
		CO5: Understand the various mathematical transforms , color image concepts and processing.
OEC 416	MOBILE COMPUTING (MC)(OE-4)	CO1: To learn about the mobile infrastructure, radio resource management, overview of generation
		1G to 5G
		CO2: To illustrate the location management involved in GSM, Mobile IP.
		CO3: To illustrate the transmission, transaction technology involved in mobile.
		CO4: To explore the wireless network in mobile.
		CO5: To discover the cognitive radio networks in mobile
OEC 417	ENTERPRISE SYSTEMS (ES)(OE-4)	CO1:Understand basic elements of Enterprise Systems
		CO2:Develop skills in understanding architecture
		CO3:Understand the application patterns
		CO4:Understand the integration and patterns
		CO5: Analyze the deployment

OEC 418	MODERN WEB APPLICATIONS (MWA)(OE-4)	CO1: Understand the various steps to design static websites.
		CO2: Develop a Web Page using the HTML5.
		CO3: Apply CSS effectively to create interactive websites.
		CO4: Implement client-side scripting using JavaScript to design dynamic websites.
		CO5: Develop end to end application - web frontend and backend development.
OEC 419	COGNITIVE RADIO (CR)(OE-4)	CO1: Understand the architecture of SDR and management of unlicensed spectrum.
		C02: Analyze the Aware and Adaptive cognitive radios.
		CO3: Analyze the spectrum awareness and interference avoidance
		CO4: Understand technical challenges in CR and various spectrum sensing methods.
		CO5: Analyze the OFDM based Cognitive radio and MIMO-OFDM channel estimation
OEC 420	AUTOMATION & CONTROL (AMC)(OE-4)	CO1: Understand the elements of automation principles
		CO2: Understand the construction and working of pneumatic systems
		CO3: Understand the working of hydraulic systems
		CO4: Understand various control techniques in automation
		CO5: Understand the automated testing and inspection methods in industry
OEC 421	HUMAN RESOURCE MANAGEMENT (HRM)(OE-4)	CO1: Understand human resource management concept and challenges
		CO2:Understand human resource system design
		CO3: Understand Functional Areas of HRM
		CO4: Understand human resource planning
		CO5: Understand human resource management in Service Sector
OEC 422	DESIGN PATTERNS (DP)(OE-4)	CO1: Understand the usage of design patterns for solving object-oriented design problems
		CO2: Describe the creational patterns abstract factory, factory method, builder, prototype, and singleton.
		CO3: Understand structural patterns: adapter, bridge, composite, decorator, facade, fly weight, proxy.
		CO4: Explain behavioral patterns chain of responsibility, command, interpreter, iterator, mediator,
		memento, observer, state, strategy, template method, and visitor.
		CO5: Explain the patterns used in solving design problems of Lexi Document Editor
OEC 423	PRESTRESSING SYSTEMS (PS)(OE-4)	CO1: Understand the principles and systems of pre-stressing.
		CO2: Understand the various methods of pretensioning
		CO3: Understand the various methods of post tensioning
		CO4: Determine the losses in pre-tensioned and post-tensioned members.
		CO5: Analyse the prestressed members with straight, concentric and eccentric tendons.
OEC 424	ADDITIVE MANUFACTURING TECHNOLOGY (ADMT)(OE-4)	CO1: Understand prototyping, and the phases of Rapid prototyping.
		CO2: Understand the rapid prototyping process chain.
		CO3: Understand the functioning of Liquid based rapid prototyping systems.
		CO4: Understand the functioning of Powder based rapid prototyping systems.
		CO5: Understand the Direct methods of Tooling and Indirect methods

		of Tooling.
OEC 425	DRONE TECHNOLOGY (DT)(OE-4)	CO1: Understand the historical development of unmanned aerial vehicles
		CO2: Understand different drone parts and their contribution for successful flight operation
		CO3: Identify the battery to be used for UAV application.
		CO4: Understand working of motor that can be used in UAV.
		CO5: Classify different microcontrollers and flight controllers
OEC 426	INFRASTRUCTURE FOR SMART CITY DEVELOPMENT (ISCD)(OE-4)	CO1: Understand the fundamental concepts of smart and sustainable cities.
		CO2: Understand the GIS applications in Smart City Planning.
		CO3: Understand the component of smart cities and dwell into their technological
		advancement.
		CO4: Understand the involvement of stake holders in the design and implementation of
		responsive smart cities.
		CO5: Explain the importance of different linkages and their defined roles including
		government, urban planners, universities, city developers and communities.
HSSEC701	UNIVERSAL HUMAN VALUES-2 (UHV-2)	CO1: Develop a holistic perspective based on self-exploration about themselves (human being), family,
		society and nature/existence.
		CO2: Understand the harmony in the human being, family, society and nature/existence
		CO3: Strengthen of self-reflection.
		CO4: Develop a commitment and courage towards implementing Human values
SCCS04	ANGULAR LAB (AR(P))	CO1: Understand the Angular and its working
		CO2: Implementing components and templates
		CO3: create single page and custom route applications
		CO4: Build applications that can get data from server
		CO5: Implement available and create user defined libraries

Estd: 1985

G Pulla Reddy Engineering College (Autonomous)

Nandyal Road, **KURNOOL – 518007.**

Affiliated to J.N.T. University, Anantapur, Ananthapuram

Programme: Computer Science and Engineering (CSE)

Course Outcomes: M.Tech CSE I & II Years (Scheme 2022)

PG-CSE: I Year (Scheme-2022)		
Course Code	**Course Name**	**Course Outcomes**
CS801	ADVANCED DATA STRUCTURES & ALGORITHMS (ADSA)	CO1: Understand the operations and applications of basic data structures.
		CO2: Explain non linear data structures -binary trees, binary search tree, AVL trees, B trees,Red-Black trees and splay trees.
		CO3: Understand the operations of heaps and their applications.
		CO4: Organize the data in the computer memory using hash functions.
		CO5: Analyze the time complexities of algorithms for solving problems.
CS802	SOFTWARE ENGINEERING AND APPLICATIONS(SEA)	CO1: Understand the phases in a software project
		CO2: Understand fundamental concepts of requirements engineering and Analysis Modelling.
		CO3: Understand the various software design methodologies.
		CO4: Learn various testing and maintenance measures.
		CO5: Estimate the project risk and project Metrics.
CS803	ARTIFICIAL INTELLIGENCE (AI)	CO1: Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents.
		CO2: Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
		CO3: Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing.
		CO4: Attain the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.
		CO5: Solve problems with uncertain information using Bayesian approaches.
CS80	FREE AND	CO1: Understand Python syntax, flow control and looping
		CO2: Create and run Python programs using in built data structures.

6	OPEN SOURCE SOFTWARE (FOSS) PE-I	CO3: Understand and implement functions to perform I/O, file and exception handling.
		CO4: Understand PHP syntax, flow control and looping.
		CO5: Build simple client server applications using PHP.
CS807	QUANTUM COMPUTING (QC) PE-I	CO1: Understand the Quantum Computation
		CO2: Understand the Framework of Quantum Mechanics
		CO3: Understand Deutsch Algorithm
		CO4: Understand Amplitude Amplification
		CO5: Implement Error Correction Codes
CS808	CLOUD COMPUTING (CC) PE-I	CO1: State the roots, deployment models and features of cloud computing.
		CO2: Summarize the usage and characteristics of virtualization in a cloud computing environment.
		CO3: Illustrate thread, task and map reduce programming models using Aneka.
		CO4: Explain the steps involved in creating apps using Salesforce.com and Google App Engine.
		CO5: Understand Grep the Web architecture and ECG using Amazon cloud.
CS809	CRYPTOGRAPHY AND NETWORK SECURITY (CNS) PE-I	CO1: Understand the concepts and principles of Network Security.
		CO2: Analyze various classical encryption techniques and block cipher structure.
		CO3: Analyze advanced encryption standard.
		CO4: Understand block cipher modes of operation.
		CO5: Explain various asymmetric ciphers.
		CO6: Understand cryptographic hash functions and digital signatures.
CS810	NATURAL LANGUAGE PROCESSING (NLP) PE-II	CO1: Understand the concepts of Natural Language Processing and the importance of Text Wrangling, Cleansing and POS tagging.
		CO2: Develop a NLP application using the NLTK library.
		CO3: Implement Text classification algorithms using scikit-learn and NLTK.
		CO4: Understand the basics of Tokenizing text and using WordNet.
		CO5: Understand the importance of Text feature extraction process to a classifier.
CS811	INFORMATION RETRIEVAL SYSTEM (IRS) PE-II	CO1: Ability to apply IR principles to locate relevant information large collections of data.
		CO2: Ability to design different document clustering algorithms.
		CO3: Implement retrieval systems for web search tasks.
		CO4: Design an Information Retrieval System for web search tasks.
		CO5: To understand the concepts of multimedia information retrieval.
CS812	DISTRIBUTED DATABASES (DDB) PE-II	CO1: Understand Distributed data Processing and Distributed DBMS Architecture.
		CO2: Analyse query processing and decomposition.
		CO3: Understand various Transaction Management concepts.
		CO4: Understand Distributed reliability and Parallel database systems.
		CO5: Illustrate the concepts of Distributed object DBMS and Object oriented data models.
CS813	WIRELESS AND	CO1: To study the Channel planning for Wireless Systems.
		CO2: To study the Mobile Radio Propagation Large-Scale Path loss.

	MOBILE NETWORKS (WMN) PE-II	CO3: To study the Mobile Radio Propagation Small-Scale Fading and Multipath.
		CO4: To study the Equalization and Diversity.
		CO5: To study the Wireless Networks.
MC101	RESEARCH METHODOLOGY AND IPR (RM & IPR)	CO1: Understand the Meaning, types of research, research problems and research design.
		CO2: To know the basic data collection methods and sampling design.
		CO3: Know the basic concepts intellectual property rights and patent design
		CO4: Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasise the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
		CO5: Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.
AU 101	ENGLISH FOR RESEARCH PAPER WRITING AC-I	CO1: Understand that how to improve your writing skills and level of readability
		CO2: Learn about what to write in each section
		CO3: Understand the skills needed when writing a Title Ensure the good quality of paper at very first- time submission
AU 102	DISASTER MANAGEMENT AC-I	CO1: Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
		CO2: Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
		CO3: Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
		CO4: Critically understand the strengths and weaknesses of disaster management approaches
		CO5: Planning and programming in different countries, particularly their home country or the countries they work in
AU 103	SANSKRIT FOR TECHNICAL KNOWLEDGE	CO1: Understanding basic Sanskrit language
		CO2: Ancient Sanskrit literature about science & technology can be understood
		CO3: Being a logical language will help to develop logic in students
CS804	SOFTWARE LAB –I	CO1: Implement programs on linear data structures
		CO2: Implement operations on binary search trees.
		CO3: Develop programs for all pairs shortest path and travelling sales person's problems using dynamic programming
		CO4: Develop a program for solving 8-Queen's problem using back tracking technique.
CS805	SOFTWARE LAB -II	CO1: Identify suitable software development process model for a given scenario
		CO2: Create a UML diagrams for a specified problem
		CO3: Apply testing methodologies for validating design models
CS814	MOBILE COMPUTING (MC)	CO1: Understand the basic concepts of wireless communication & mobile computing.
		CO2: Understand the wireless medium access controlling mechanisms and GSM.

		CO3: Understand the WLAN System Architecture, Protocol Architecture, And Physical Layer.
		CO4: Acquiring knowledge on the structure & concepts of Mobile IP.
		CO5: Understand the Traditional TCP and Classical Improvements of TCP.
CS815	DATA SCIENCE(DS)	CO1: Write python programs using the core concepts like Lists, Dictionaries, sets, tuple, functions and regular expressions.
		CO2:Demonstrate various mathematical operations on arrays using NumPy
		CO3:Analyze and manipulate Data using Pandas
		CO4:Creating static and interactive visualizations using Matplotlib.
		CO5:Enumerate machine learning algorithms, Describe the Classification and Clustering
CS818	BIG DATA (BD) PE-III	CO1: Work with big data platform and explore the big data analytics techniques, business
		CO2: Design efficient algorithms for mining the data from large volumes.
		CO3: Analyze the HADOOP and Map Reduce technologies associated with big data analytics.
		CO4: Understand the fundamentals of various big data analytics techniques.
		CO5: Build a complete business data analytics solution.
CS819	MACHINE LEARNING (ML) PE-III	CO1: Understand machine learning Systems and Data preprocessing techniques
		CO2: Build Simple and Multiple Linear Regression Models
		CO3: Understand Classification Techniques like Decision Trees and KNN
		CO4: Implement SVM and Decision Trees.
		CO5: Apply the sentiment classification techniques in text analytics.
CS820	DATA MINING (DMG) PE-III	CO1: Understand the importance of data mining and the principles of business intelligence.
		CO2: Organize and Prepare the data needed for data mining using preprocessing techniques.
		CO3: Understand data mining classification techniques.
		CO4: Implement association rule mining using Market basket analysis.
		CO5: Analyze unsupervised clustering mining algorithms.
CS821	OBJECT ORIENTED ANALYSIS AND DESIGN(OOAD) PE-III	CO1: Understand the importance of model, UML and Class diagrams.
		CO2: Describe the structural and behavioralmodeling of a software system.
		CO3: Design an event driven system with dynamic dimensions.
		CO4: Design logical elements of a system.
		CO5: Construct an architectural template for applications and deployment diagrams.
CS822	ADVANCED COMPUTER ARCHITECTURE (ACA) PE-IV	CO1: Understand Parallel computer models, Parallelism, Program partitioning, Scheduling and Program Flow mechanisms.
		CO2:Identify tradeoffs between Complex Instruction Set Computers (CISC), Reduced Instruction Set Computers (RISC), Scalar and Vector processor.
		CO3: Explain Hierarchical bus system and Backplane bus specification.
		CO4: Understand Cache memory organization, Shared memory organization and concepts in Hierarchical memory technology.
		CO5: Classify Pipeline Processors based on Processing levels, Configurations and Control Strategies.
		CO6: Understand Multiprocessor System Inter connects, Cache Coherence, Synchronization Mechanisms and Message Passing

		Mechanisms.
CS823	IMAGE AND VIDEO PROCESSING (IVP) PE-IV	CO1: : Understand the relationships between pixels in digital images and perform various linear and non-linear operations on pixels in a digital image.
		CO2: Apply various image enhancement techniques both in spatial and frequency domain.
		CO3: Understand image compression models and different types of compression techniques.
		CO4: Perform Image segmentation on real time images.
		CO5: Understand the principles of Video imaging and Video display.
CS824	SOFT COMPUTING (SC) PE-IV	CO1: Analyze various neural network architectures and learning models.
		CO2: Design associative memory networks and unsupervised learning networks.
		CO3: Define the fuzzy logic and sets.
		CO4: Study of membership functions and fuzzy arithmetic operations.
		CO5: Understand genetic algorithm concepts and their applications.
CS825	DIGITAL FORENSICS (DF) PE-IV	CO1: Understand the fundamental concepts of digital forensic, digital evidence and the incident response process.
		CO2:Apply various data acquisition techniques and tools on the evidences.
		CO3:Learn the methods applicable for different forensic investigations.
		CO4:Usage of various forensic tools to analyse different forensics data.
		CO5:Gains knowledge on cloud forensic procedures and challenges.
		CO6: Understand the concept of file system and their use in forensic analysis.
CS826	COMPUTER VISION (CV) PE-V	CO1: Present the image formation process.
		CO2: Use the image processing operators for image preprocessing and conversion.
		CO3: Apply the data interpolation techniques for model fitting and optimization.
		CO4: Understand the Deep Neural Networks and CNNs for computer vision recognition and lower level vision tasks.
		CO5: Understand object detection and semantic segmentation methods.
CS827	HIGH PERFORMANCE COMPUTING(HPC) PE-V	CO1: Understand the limitations, control structure and communication models of parallel computer systems.
		CO2: Summarize the decomposition techniques and mapping techniques for parallel algorithms.
		CO3: Understand One-to-all, all-to-one and all-to-all communication operations for parallel computers.
		CO4: Interpret the programming techniques using message passing paradigm.
		CO5: Understand the thread programming for shared address space platforms using OpenMP.
CS828	DEEP LEARNING (DL) PE-V	CO1: Understand the historical trends in deep learning and use Tensor flow for performing Linear Regression, Gradient Descent, optimizers, graph visualization and training curves.
		CO2: Summarize the fundamentals of Artificial Neural Networks.
		CO3: Understand the training of Deep Neural Nets.
		CO4: Understand the Convolutional Neural Networks Architecture.
		CO5: Understand the Recurrent Neural Networks and deep RNN training.
CS829	DESIGN PATTER	CO1: Understand the usage of design patterns for solving object-oriented design problems

	NS (DP) PE-V	CO2:Describe the creational patterns abstract factory, factory method, builder, prototype, and singleton.
		CO3:Understand structural patterns: adapter, bridge, composite, decorator, facade, fly weight, proxy.
		CO4:Explain behavioral patterns chain of responsibility, command, interpreter, iterator, mediator, memento, observer, state, strategy, template method, and visitor.
		CO5:Explain the patterns used in solving design problems of Lexi Document Editor
AU 201	STRESS MANAGEMENT BY YOGA (SMY)	CO1: Develop healthy mind in a healthy body thus improving social health also
		CO2: Improve efficiency
AU 202	PEDAGOGY STUDIES (PS)	CO1: What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
		CO2: What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
		CO3: How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?
AU 203	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS (PDTLES)	CO1: Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
		CO2: The person who has studied Geeta will lead the nation and mankind to peace and prosperity
		CO3: Study of Neetishatakam will help in developing versatile personality of students
CS816	SOFTWARE LAB –III	CO1: Examine the process for importing and exporting the data.
		CO2: Apply appropriate data collection and pre-processing methods.
		CO3: Identify different data analysis Techniques suitable for a given applications
		CO4: Demonstrate data visualization techniques for Data Analysis
CS817	SOFTWARE LAB –IV	CO1: Implement the preprocessing techniques on a given dataset.
		CO2: Apply machine learning algorithms for data analytics.
		CO3: Analyze various text categorization algorithms.
		CO4: Solve Big Data Analytics problems using Hadoop framework.

COURSE OUTCOMES OF ALL THE COURSES OF SCHEME 2020

B.Tech. CE I Semester (Scheme :2020)

S.No	Course Name	Course Outcomes
1	Engineering Mathematics – I (BS101)	**CO1:** Find the solution for simultaneous system of linear equations and Eigen values and Eigen vectors. **CO2:** Solve first order differential equations and its applications. **CO3:** Solvehigher order differential equations and its applications. **CO4:** Understand Rolle's and Lagrange's mean value theorems. Evaluate maxima & minima and areas and volumes by multiple integrals. **CO5:** Learn Laplace transform of a function and solve the differential equations using Laplace transforms.
2	Engineering Chemistry (BS109)	**CO1:**Understand the concept of electrochemistry distinguishes primary and secondary cell, energy storage devices and explains the concept of corrosion with preventing methods. **CO2:** Describes the water quality issues for steam generation in the boilers and problems associated with treatment. **CO3:** Understand the basic concepts of phase rule and refractories. **CO4:** Judge the quality of coal, petrol, diesel and lubricants. Understands the efficiency of combustion. **CO5:** Understand the chemistry of polymers and composites.
3	English (HU101)	**CO1:** Use Grammatically acceptable English in Oral and Written communication. **CO2:** Use appropriate Vocabulary in Technical and General Contexts.

		CO3: Comprehend General and Technical Content using various Reading Skills like Skimming and Scanning. **CO4:** Write Letters, Summaries and Essays of topical, Narrative, Descriptive, Analytical and Persuasivenature. **CO5:** Write Job Applications, Resumes, Memos and E-mails.
4	Engineering Drawing (ME101)	**CO1:**Understand the concept of projections of an object and draw the projection of points, straight lines and planes **CO2:** Draw projection of regular solids **CO3:** Draw the sectional views of regular solids and their surface developments **CO4:** Draw the orthographic views from given isometric view **CO5:** Draw the isometric views from the orthographic views
5	Programming for Problem Solving (CS101)	**CO1:** Understand fundamentals of problem solving concepts with various data types and operators **CO2:** Apply conditional and iterative statements for solving a given problem **CO3:** Illustrate the applications of functions and storage classes. **CO4:** Apply the concepts of pointers and dynamic memory management in problem solving. **CO5:** Understand the purpose of structures, unions and files.
6	Engineering Chemistry Lab (BS113)	**CO1:** Understand and appreciate various analytical methods including instrumentation that acts as tools in the analysis of water **CO2:** Understand various analytical methods in the analysis of an alloy. **CO3:** Understand various analytical methods

		including instrumentation that acts as tools in the analysis of different fuels.
7	Phonetics & Communication Skills Lab (HU103)	**CO1:** Speak Internationally Intelligible English without mother tongue accent. **CO2:** Adopt appropriate intonation patterns for effective Oral Communication **CO3:** Identify International Phonetic Symbols to find the pronunciation of new words. **CO4:** Integrate Listening Skills & Speak in English confidently, fluently and effectively. **CO5:** Exhibit team playing & Leadership skills.
8	Programming for Problem Solving Lab (CS107)	**CO1:** Implement programs using conditional and loop statements in C. **CO2:** Develop programs using 1-Dimensional and 2-Dimensional arrays. **CO3:** Perform Call by value, Call by reference and Recursion through functions. **CO4:** Implement programs using pointers. **CO5:** Develop programs using structures and file concepts.

B.Tech. CE II Semester (Scheme :2020)

S.No	Course Name	Course Outcomes
1	Engineering Mathematics – II(BS104)	**CO1:** : Utilize Numerical Methods and principles of least square methods in engineering problems. **CO2:** Determine the Fourier series of a function and its expansion. **CO3:** Understand the Fourier and Z-transforms. **CO4:** Use Partial differential equations and method of separation of variables in solving the one dimensional wave and Heat equations. **CO5:** Understand vector differentiation &

		integration and its applications.
2	Applied Physics (BS110)	**CO1:** Understand the origin of magnetism, hysteresis, soft and hard magnetic materials; Dielectrics and their characteristics; superconductivity, types, characteristics, Meissner, Josephson effects. **CO2:** Understand the phenomenon of interference, diffraction of light and their applications. **CO3:** Understand the production, detection, properties and applications of ultrasonic waves, determination of velocity of ultrasonic waves in liquids. Principles of quantum mechanics, Schrodinger's equation and its applications. **CO4:** Understand the theory and different production methods of lasers and their applications, different types of optical fibers, losses in fibers and applications of optical fibers. **CO5:** Understand the properties, synthesis, applications of Nano materials and Carbon Nanotubes.
3	Elements of Building Science (CE101)	**CO1:** Classify and understand the applications of basic building materials. **CO2:** Understand the applications of advanced building materials. **CO3:** Explain the principles and methods of construction of building components **CO4:** Understand the building services and principles of planning. **CO5:** Understand the bye-laws in planning of residential buildings.
4	Engineering Mechanics (CE102)	**CO1:** Calculate the resultant of different force systems **CO2:** Determine the unknown forces in determinate structures using equilibrium conditions **CO3:** Determine the axial forces in the members of

		determinate trusses **CO4:** Understand the concept of friction **CO5:** Determine the centroid and moment of inertia of areas **CO6:** Compute the stresses and strains of axially loaded members, elastic constants of different materials
5	Data Structures Through C (CS105)	**CO1:** Understand the concepts of array data structure and its applications **CO2:** : Understand the linked list data structure and its operations. **CO3:** : Illustrate the operations on stack data structure. **CO4:** Illustrate the operations on queue data structure. **CO5:** Understand the concepts of trees and recursive traversals on binary trees.
6	Environmental Studies ()	**CO1:** Apply the knowledge of environmental issues in his area of work. Understands the need for the conservation of Natural resources for sustainable development. **CO2:** Understands the importance of Ecosystem and conservation of biodiversity **CO3:** Understands the problems due to environmental pollution with remedial measures and issues related to environment. **CO4:** Understands the disaster management in prevention of loss of life and property **CO5:** Understands the use of IT & related technology to conserve environment & human health.
7	Applied Physics Lab (BS114)	**CO1:** Apply the knowledge of physics laboratory in measuring the standard values. **CO2:** Apply theoretical knowledge to experimental

		values.
8	Computer Aided Civil Engineering Drawing Lab (CE103)	**CO1:** Develop Parametric design and the conventions of formal civil engineering drawings. **CO2:** Understand the use and application of Auto-cad commands **CO3:** Draw a line diagram of Office, Health centre and Library Buildings. **CO4:** Draw the Plan and Sectional views of residential and Industrial buildings **CO5:** Draw detailing of reinforcement in structural elements
9	Engineering Workshop (ME102)	**CO1:** To understand the usage of tools and equipment in fitting, carpentry, house wiring, soldering, Foundry and smithy. **CO2:** To prepare of simple models in carpentry, fitting and smithy **CO3:**To prepare sand mould using foundry tools **CO4:** To do soldering of circuit boards and **CO5:** To give electrical connections in house wiring.

B.Tech. CE III Semester (Scheme: 2020)

S.No	Course Name	Course Outcomes
1	Geological Science (GS) (CE201)	**CO1:**Emphasize the branches of geology in various Civil Engineering projects. **CO2:** Expertise the identification of different rocks and their suitability in foundation sites and as building material. **CO3:** Understand the mitigation & assessment of geological hazards and necessary Precautionary measures to safe guard Civil Engineering structures. **CO4:** Expertise in acquiring knowledge in

		geological investigation methods. **CO5:** Assessment, selection and improvement of competency of sites for construction of dams, reservoirs, tunnels etc.
2	Strength Of Materials – I (SM1) (CE202)	**CO1:**Determine shear force and bending moment for determinate beams under transverse loading and draw shear force and bending moment diagrams. **CO2:**Determine the bending and shear stress variation for determinate beams **CO3:**Determine slope and deflection of determinate beams using Double integration method, Macaulay's method and Moment area method. **CO4:**Analyze the short column and long column under axial and eccentric loading and thermal stresses and strains in composite sections **CO5:**Analyze the effect of torsion on circular shafts and Understand the concepts of springs.
3	Surveying (SUR) (CE203)	**CO1:**Use various conventional instruments involved in surveying with respect to utility and precision. **CO2:** Plan a survey, taking accurate measurement, booking of field measurements, plotting and adjustment of traverse. **CO3:** Understand the methods of leveling, contouring and find the elevations & distances of inaccessible objects. **CO4:** Understand the setting out methods of different types of curves and building / culvert. **CO5:** Understand photogrammetry and Triangulation survey
4	Fluid Mechanics (FM) (CE204)	**CO1:**Understand the fluid properties and measure the fluid pressure. **CO2:** Check the stability of floating and submerged bodies. **CO3:** Solve problems related to static and dynamic

		conditions of fluid. **CO4:** Measure the discharge through pipes, tanks and channels. **CO5:** Understand the laminar and turbulent flows, major and minor losses in pipes. **CO6:** Understand the concepts of boundary layer theory and dimensional analysis.
5	Concrete Technology (CT) (CE205)	**CO1:**Determine the properties of concrete Ingredients. **CO2:** Understand the properties of concrete both in fresh and hardened state. **CO3:** Understand the long term behavior of concrete. **CO4:** Compute the mix design of concrete using Indian Standard methods **CO5:** Understand the usage of special concretes according to the existing situations.
6	Constitution of India (CI) (MC103)	**CO1:**Understand the formation and principles of Indian Constitution. **CO2:**Understand structure and functions of Union government and State executive. Duties of President, Vice president, Prime Minister, Governor, Chief Minister cabinet and State legislature. **CO3:** Understand constitutional amendments of 42, 44,74,76,86 and 91. Central-State relations, President rule **CO4:** Understand Indian social structure and languages in India. Rights of women, SC, ST and then weaker section. **CO5:** Understand the structure of Judiciary, Role and functions of Supreme Court, High court and Subordinate courts, Judicial review.
7	Strength Of Materials Lab [SM(P)] (CE206)	**CO1:**Determine the mechanical properties of steel, brass, aluminum and other engineering materials.

		CO2: Determine the deflections in simply supported and overhanging beams. **CO3:** Determine the hardness, compressive strength, shear strength and impact strength of materials. **CO4:** Develop skills to analyse and interpret the experimental data
8	Surveying Lab [SUR(P)] (CE207)	**CO1:**Apply the knowledge, techniques, skills and applicable tools of the discipline to engineering and surveying activities. **CO2:**Perform survey, taking accurate measurements, booking of field measurements, plotting and adjustment of traverse. **CO3:** Prepare contour map of an area and L.S & C.S of the given project. **CO4:** Calculate the Elevations and Distances of accessible and inaccessible points. **CO5:** Set out the Curve and Foundation trench of a building & culvert.
9	Concrete Technology Lab [CT(P)] (CE208)	**CO1:**Determine the properties of cement as per IS specifications. **CO2:** Determine the properties of aggregates as per IS specifications. **CO3:** Determine the properties of fresh concrete as per IS specifications. **CO4:** Determine the properties of hardened concrete as per IS specifications. **CO5:** Determine the strength of concrete by NDT.
10	Soft Skills Lab [SS(P)] (SCCM01)	**CO1:**Communicate effectively and enhance their interpersonal relationship building skills with renewed self-confidence. **CO2:** Work together in teams and accomplish objectives in a cordial atmosphere.

		CO3: Face interviews, GDs and give presentations. **CO4:** Understand and develop the etiquette necessary to present themselves in a professional setting. **CO5:** Learn the Principles of Personal effectiveness.

B.Tech. CE IV Semester (Scheme :2020)

S.No	Course Name	Course Outcomes
1	Environmental Engineering (EE) (CE209)	**CO1:**Estimate the water demand considering future projection of population. **CO2:** Evaluate various sources of water in terms of quantity and quality. **CO3:** Analyze and design unit operation of water treatment units **CO4:** An ability to distribute the treated water to public including pipe network. **CO5:** Able to understand the different aspects of Air & Noise pollution.
2	Strength of Materials –II (SM2) (CE210)	**CO1:**Analyse thin cylindrical and spherical shells subjected to pressure **CO2:** Analysis of two dimensional stress at a point and understand the concepts of theories of failure. **CO3:**Analyse the propped cantilever and fixed beams subjected to transverse loads and draw shear force and bending moment diagrams. **CO4:**Analyse the continuous beams subjected to transverse loads and draw shear force and bending moment diagrams. **CO5:**Analyse structural elements subjected to unsymmetrical bending. **CO6:** Understand the concepts of shear flow and shear centre.
3	Transportation Engineering	**CO1:**Understand the importance of transportation,

	(TE) (CE211)	classification of highways and conduct the surveys required for highway alignment. **CO2:** Understand the elements of highway geometric design **CO3:** Understand and apply the principles of Traffic Engineering **CO4:** Understand the various traffic control devices along with the design of signals. **CO5:** Analyze and design the flexible and rigid pavements as per IRC specifications.
4	Hydraulics & Hydraulic Machinery (HHM) (CE212)	**CO1:**Understand the basics of flow in open channel and determine the dimensions of most economical sections for open channel. **CO2:** Analyze the characteristics of surface profiles and hydraulic jump in open channel. **CO3:** Determine the force exerted by the jet on vane for different conditions. **CO4:** Understand the working principles of turbines and pumps. **CO5:** Determine work done and efficiency and evaluate the performance of turbines and pumps. **CO6:** Understand the concept of unit quantities and specific quantities for pumps and turbines
5	Managerial Economics and Principles Of Accountacy(MEPA) (HU201)	**CO1:**Understand the nature and scope of managerial economics and the concepts of demand analysis **CO2:** Understand the significance of demand elasticity and the concepts of demand forecasting. **CO3:** Understand the concepts of production and cost analysis and different market structures and their competitive situations. **CO4:** Understand the concept and significance of capital budgeting. **CO5:** Understand the principles and significance of

		accountancy and preparation of final accounts.
6	Geographical Information Systems Lab [GIS(P)] (CE213)	**CO1:**Understand the spatial and non-spatial data, raster and vector data **CO2:** Digitize point, polyline and polygon features **CO3:** Manage the attribute data **CO4:** Build a model and perform spatial analysis using clip, buffer, overlay and selection tools **CO5:** Prepare high quality maps
7	Transportation Engineering Lab [TE(P)] (CE214)	**CO1:**Determine the properties of aggregates and bitumen **CO2:** Determine the Marshall stability and flow value of bitumen mix **CO3:** Determine and report the traffic volume and speeds of vehicles of a given stretch **CO4:** Develop skills to analyze and interpret the experimental data.
8	Fluid Mechanics Lab [FM(P)] (CE215)	**CO1:**Measure the rate of flow through tanks using Orifice and Mouthpiece. **CO2:** Measure the rate of flow in channels using Rectangular and Triangular Notch. **CO3:** Measure the rate of flow in pipes using Venturimeter / Orificemeter. **CO4:** Calculate the loss of head due to friction in a given pipe. **CO5:** Calculate the loss of head due to minor losses in pipe line
9	Advanced Surveying Lab [ASUR(P)] (SCCE01)	**CO1:**Understand the applications of advanced surveying instruments and methods. **CO2:** Relate the knowledge of surveying to the modern instruments and methods. **CO3:** Understand the applications of total station **CO4:** Gain the skill and field knowledge using

		DGPS. **CO5:** Learn the application of E survey software.

B.Tech. CE V Semester (Scheme :2020)

S.No	Course Name	Course Outcomes
1	Analysis of Structures (AS) (CE301)	**CO1:**Analyse the determinate beams and trusses by strain energy theorems. **CO2:**Analyse the indeterminate beams and trusses by strain energy theorems. **CO3:**Analyse the continuous beams and portal frames by slope deflection method. **CO4:**Analyse the continuous beams and portal frames by moment distribution method. **CO5:**Analyse the effects of moving loads on simply supported beams and trusses by influence line diagrams.
2	Water Resources Engineering-I (WRE1) (CE302)	**CO1:**Understand the various processes of hydrologic cycle, measurement of rainfall and analyze the rainfall data. **CO2:** Estimate and measure Evaporation, Infiltration and Stream flow. **CO3:** Analyze rainfall and runoff pattern and estimate the runoff by applying the concept of hydrograph and Unit hydrograph. **CO4:** Understand the concept of flood routing and estimate the design flood. **CO5:** Understand the types and methods of irrigation and water requirement of crops
3	Reinforced Concrete Design & Drawing (RCDD) (CE303)	**CO1:**Understand the concepts of limit state method for reinforced concrete elements. **CO2:** Design simply supported and continuous beams with detailing. **CO3:** Design one–way, Two–way and continuous

		slabs along with limit state of serviceability **CO4:** Design axially loaded columns, eccentrically loaded columns. **CO5:** Design isolated footings and stair cases.
4	Soil Mechanics (SMECH) (CE304)	**CO1:**Understand the importance of functional relationships related to soil. **CO2:** Determine the index properties of soils for its classification. **CO3:** Determine the permeability and seepage of soils for fluid flow characteristics analysis. **CO4:** Estimate the vertical stresses in soils due to self weight, point and distributed loads required for settlement calculation. **CO5:** Understand the importance and modification of soil properties by compaction. **CO6:** Compute the consolidation characteristics and settlement of soils.
	Professional Elective – I	
5	Sanitary Engineering (SE) (CE313)	**CO1:**Estimate the quantity of sanitary and storm sewage. **CO2:** Explain the essential features of various types of sewers and sewer appurtenances. **CO3:** Identify the physical, chemical and biological properties of waste water **CO4:** Analyze and design the unit operations for waste water treatment. **CO5:** Acquire an ability to manage Municipal Solid Waste.
	Basics of Computational Hydraulics (BCH) (CE314)	**CO1:**Understand the basics of computational hydraulics. **CO2:** Apply conservation laws for homogeneous and stratified fluid flows. **CO3:** Understand the hydraulic jump and its

		computations **CO4:** Apply the Different forms of conservation laws to storm-sewer networks. **CO5:** Apply the FD techniques to steady and unsteady flows in open channels.
	Environmental Impact Assessment (EIA) (CE315)	**CO1:**Identify the environmental attributes to be considered for the EIA study. **CO2:** Understand the IEE and EIA Regulatory framework as specified in EPA and EPR, and the steps and process involved in IEE and EIA. **CO3:** Formulate the objectives of the EIA studies. **CO4:** Identify the methodology to prepare rapid EIA **CO5:** Prepare the EIA reports and environmental management plans
	Infrastructure Planning and Management (IPM) (CE316)	**CO1:**Understand the infrastructure demand and supply requirements in India. **CO2:** Prepare a forecast model for infrastructure demand **CO3:** Understand the strategic planning for infrastructure development at urban, regional and national level **CO4:** Understand the concepts of Infrastructure Management. **CO5:** Understand the Emerging Trends in Infrastructure and Sectoral overview.
	Open Elective-1	
6	Optimization Techniques (OT) (OEC301)	**CO1:**Understand the concepts of optimization and solve linear programming problems. **CO2:** Solve the engineering problems using Integer programming technique. **CO3:** Solve the engineering problems using Kuhn tucker conditions and Lagrangean multiplier

		method. **CO4:** Solve the engineering problems using dynamic programming technique. **CO5:** Apply non-traditional optimization techniques to solve engineering problem
	Remote Sensing &Gis(RSGIS) (OEC302)	**CO1:**Understand the Photogrammetry, EDM and Total station surveying principles to solve surveying problems using appropriate tools and techniques. **CO2:** Understand the concepts of remote sensing and interpretation methods. **CO3:** Understand the importance of maps, concept of map projections **CO4:** Understand the concept of GIS and its applications, different data models, spatial analysis. **CO5:** Understand the principles used in GNSS and Drone surveying, data collection methods, error in observations and corrections.
	Introduction To Java (OEC303)	**CO1:**Understand the fundamentals of OOPS concepts, input and output. **CO2:** Understand the classes and objects. **CO3:** Understand the inheritance and interfaces. **CO4:** Understand the string handling methods. **CO5:** Understand the exception handling.
	Internet Of Things (IoT) (OEC304)	**CO1:**Understand the basic knowledge of internet of things and its design. **CO2:** Understand the purpose of sensors and actuators in IoT. **CO3:** Analyze various IoT protocols. **CO4:** Design the IoT projects using Arduino. **CO5:** Understand Raspberry-Pi Processor and Raspbian Operating Systems.
	Scientific Programming With	**CO1:**Understand programming with mathematical

	Python (SPY) (OEC305)	formulas. **CO2:** Apply the concepts of Loops, Lists, Functions and Branching. **CO3:** Work with Input, Error Handling and Modules. **CO4:** Learn to visualize mathematical functions and mathematical calculations. **CO5:** Work on Dictionaries and Strings. **CO6:** Apply the concepts of Object Oriented Programming.
	Introduction To Database Systems (IDBS) (OEC306)	**CO1:**Understand the concepts of database management systems and entity relationship modeling **CO2:** Use SQL commands to create, retrieve, update, and delete data from the database. **CO3:** Comprehend the concepts of normalization techniques **CO4:** Understand the properties of transactions in a database system **CO5:** Understand the concurrency control techniques and recovery system.
	Ethical Hacking (EH) (OEC307)	**CO1:**Understand the basics of security and ethical hacking. **CO2:** Understand about foot printing and types of attacks in social engineering. **CO3:** Understand about sniffers, hijacking and DoS attacks. **CO4:** Understand the importance of webserver hacking,database hacking and SQL Injection. **CO5:** Understand about Wireless technologies,intrusion detection and firewalls.
	Entrepreneurship Development (EDP)	**CO1:**Analyse the role of entrepreneurship in economic development.

	(OEC308)	**CO2:** Understand rural entrepreneurship and small enterprises. **CO3:** Examine the project reports. **CO4:** Understand the ownership structure of company and women entrepreneurship in India. **CO5:** Understand the support by specified institutions for entrepreneurship development.
	Introduction to Information Systems (IIS) (OEC309)	**CO1:**Understand the concepts of Computer architecture and functionalities of System software. **CO2:** Understand the page replacement and CPU Scheduling Algorithms. **CO3:** Understand the phases of software development life cycle and process models. **CO4:** Design ER model for real life scenarios. **CO5:** Apply SQL commands to create, update, modify and retrieve data from the data bases. **CO6:** Apply normalization techniques to normalize the database.
	Neural Networks & Fuzzy Logic (NNFL) (OEC310)	**CO1:**Understand the basic concepts of neural networks. **CO2:**Analyse the supervised learning feedback networks. **CO3:**Analyse the unsupervised learning feedback networks. **CO4:** Understand the concepts of fuzzy logic and fuzzy set theory. **CO5:** To apply the knowledge of Neural Networks & fuzzy logic to real time systems.
7	Professional Ethics (PE) (MC104)	**CO1:**Understand the importance of Ethics & Human Values and become Humane. **CO2:** Know the moral autonomy and uses of Ethical theories. **CO3:** Know the responsibilities of the Engineer

		towards the society. **CO4:** Assess environmental issues to take Protective measures to evade risks. **CO5:** Determine various roles of Engineer and help them make the world a better place.
8	Hydraulics & Hydraulic Machines Lab [HHM(P)] (CE305)	**CO1:**Determine the force exerted by jet of water on fixed vane. **CO2:** Determine the open channel roughness. **CO3:** Determine the performance of hydraulic turbines. **CO4:**Determine the efficiency of Centrifugal/Reciprocating pump. **CO5:** Establish the characteristic curves of pumps.
9	Engineering Geology Lab [EGL(P)] (CE306)	**CO1:**Identify the mineral based on physical characteristics. **CO2:** Identify the rocks and understand the properties of each rock type. **CO3:** Interpret the geological maps and their suitability to civil engineering works. **CO4:** Understand the problems on structural geology **CO5:** Understand the suitability of sites based on study of geological maps.
10	Building Information Modelling Lab [BIM(P)] (SCCE02)	**CO1:**Understand the basics of BIM and their applications. **CO2:** Understand the usage of BIM tools and Toolbar. **CO3:** Use advanced editing tools in making a 3D model of any residential/commercial building **CO4:** Prepare templates, create basic walls, curtain walls and also edit the walls like divide,creating openings, etc. **CO5:** Apply tools like creating floors, roofs, walls,

		etc. in making 3D models. **CO6:** Planning and execution of residential floor plan in a given area.

B.Tech. CE VI Semester (Scheme :2020)

S.No	Course Name	Course Outcomes
1	Steel Structures Design & Drawing (SSDD) (CE307)	**CO1:**Design the welded and bolted connections. **CO2:** Design the tension members. **CO3:** Design the compression members. **CO4:** Design the laterally restrained and unrestrained beams and plate girder. **CO5:** Design the slab and gusset bases for the columns.
2	Water Resources Engineering-II (WRE2)	**CO1:**Understand the occurrence and distribution of ground water. **CO2:** Design the canals using silt theories. **CO3:** Determine the storage capacity of reservoir and yield from the reservoir. **CO4:** Analyze the stability of gravity dam and seepage pattern in earth dam and understand about the spillways. **CO5:** Understand the concepts of Cross Drainage works and Canal Regulation works.
3	Foundation Engineering (FE) (CE309)	**CO1:**Determine the shear strength of different soils. **CO2:**Prepare the soil investigation report after conducting the soil investigation and analyse the stability of slopes. **CO3:** Calculate the lateral earth pressure on retaining structures required for its safe design. **CO4:** Assess the bearing capacity of soil required for the design of shallow foundation. **CO5:** Understand the types of pile foundations and

		estimate the load carrying capacity of single and group of piles.
	Professional Elective-II	
4	Advanced Structural Analysis (ASA) (CE317)	**CO1:**Analyse the three and two hinged arches. **CO2:**Analyse the three hinged suspension bridges **CO3:**Analyse the indeterminate structures using plastic analysis. **CO4:**Analyse the frames by approximate method of analysis. **CO5:**Analyse the one dimensional elements using matrix methods.
	Groundwater Hydrology (GWH)(CE318)	**CO1:**Understand the basic concepts of groundwater. **CO2:**Analyse the movement of groundwater. **CO3:** Estimate the rate of flow in to an aquifer. **CO4:** Understand the concepts of water wells and groundwater recharge methods. **CO5:** Analyze the problems of saline water intrusion.
	Finite Element Methods (FEM) (CE319)	**CO1:**Understand the concepts of FEM and Energy principles **CO2:** Analyze Axi-symmetric bodies of revolution **CO3:** Analyze stiffness matrix and Shape Functions for Beam & Bar elements **CO4:** Analyze Two Dimensional elements for plane stress and plane strain conditions **CO5:** Analyze Two Dimensional Isoparametric elements with Four and Eight nodes
	Intelligent Transportation Systems (ITS)(CE320)	**CO1:**Understand the various data collection techniques used in ITS. **CO2:** Understand the importance of traffic management centers and vehicle positioning

		systems. **CO3:** Understand the sensor and communication technologies. **CO4:** Understand the application of various ITS methodologies **CO5:** Understand the significance of ITS under Indian conditions.
	Open Elective-II	
5	Renewable Energy Sources (RES) (OEC311)	**CO1:**Understand various sources of energy and solar geometry. **CO2:** Describe the process of harnessing solar energy in the form of heat. **CO3:** Explore basic terms of wind and the extraction of energy from wind. **CO4:** Understand the technologies involved in extraction of biomass energy and geothermal Energy. **CO5:** Understand Tidal, Wave and Ocean energy conversion methods and concepts of emerging technologies.
	Industrial Safety (IS) (OEC312)	**CO1:**Understand the principles of safety management including safety audit, safety education and accident investigation. **CO2:** Understand the causes and implication of fire and explosion and the preventive measure. **CO3:** Understand the machine and construction safety assessment and safeguarding methods. **CO4:** Understand the effect of toxic substances and hazardous chemicals. **CO5:** Understand the modes of electrical hazards and safety measures in electrical and information technology industries.
	Web Technologies (WT)	**CO1:**Design a web page using text formatting tags,

	(OEC313)	hyperlinks. **CO2:** Develop a webpage with images, tables, hyperlinks, lists, CSS. **CO3:** Design a dynamic web pages using Java script. **CO4:** Design a form using HTML forms &controls. **CO5:** Understand the basic concepts of PHP and database connection using XAMPP Server.
	Introduction to Cyber Security (ICS) (OEC314)	**CO1:**Discriminate and analyze the problems in cybercrime. **CO2:** Identify the different classes of attacks. **CO3:** Synthesize the cybercrime issues on wireless and mobile devices. **CO4:** Use and apply the modern cyber forensics tools. **CO5:** Analyze the computer forensic problems for feasible solutions.
	Nano Technology (NNT) (OEC315)	**CO1:**Understand the principles behind nanotechnology and nanomaterial's. **CO2:** Analyze the fabrication, characterization, and manipulation of nanomaterial's. **CO3:** Understand about metal nano particle based sensors. **CO4:** Analyze about nano wire based sensors. **CO5:** Understand Sensors Based on Nanostructures of Metal Oxides
	Disaster Management (DM) (OEC316)	**CO1:**Understand the definitions and terminologies used in disaster management. **CO2:** Understand the types and categories of disasters. **CO3:** Understand the impact of disasters on socio-economic and environment.

		CO4: Plan for disaster risk reduction, mitigation and management strategies. **CO5:** Understand the relationship between development and disasters.
	Project Management (PM) (OEC317)	**CO1:**Understand the methods of planning, scheduling and principles of construction management. **CO2:** Formulate, solve CPM and PERT networks. **CO3:** Understand the structure of organization and resource allocation. **CO4:** Understand the procedure for documentation of tenders, contracts & time-cost analysis. **CO5:** Understand basics of engineering economics and solving of cash flow problems. **CO6:** Understand the concepts of quality control and safety management.
	Advanced Information Systems (AIS) (OEC318)	**CO1:**Demonstrate the Object oriented concepts. **CO2:** Interpret different types of Inheritance and Polymorphism. **CO3:** Classify layer functionalities of OSI reference model and TCP Protocol suite. **CO4:** Summarize the concepts of internetworking, security and IP addressing. **CO5:** Demonstrate different types of protocols and web contents used in web design.
	Product Life Management (PLM) (OEC319)	**CO1:**Understand Product life cycle management process. **CO2:** Understand different steps in Product development process. **CO3:** Get knowledge on Product data management. **CO4:** Understand the implementation of PLM and its impact on the organization. **CO5:** Understand core functions of PLM and

		supply chain and ERP systems.
	Industry 4.0 (I4.0) (OEC320)	**CO1:**Understand the Characteristics, Sensors, Actuators and Communication models for industry 4.0. **CO2:** Understand Fourth revolution and Industry operations. **CO3:** Understand the Cyber-Physical Systems, Sensors, platforms of Industrial IoT. **CO4:** Understand the Cyber security, Industrial Internet Systems. **CO5:** Understand Business Models and Architecture, Key enablers in Industrial IoT.
6	Essence of Indian Traditional Knowledge (EITK) (MC104)	**CO1:**Understand the concept of Traditional knowledge and its importance. **CO2:** Explain the need and importance of protecting traditional knowledge. **CO3:** Illustrate the various enactments related to the protection of traditional knowledge. **CO4:** Interpret the concepts of Intellectual property to protect the traditional knowledge. **CO5:** Understand the traditional knowledge in different sectors.
7	Structural Analysis and Design Lab [SAD(P)] (CE310)	**CO1:**Understand basic commands used in STAAD Pro and their applications. **CO2:**Analyse the structure for various loading conditions. **CO3:**Analyse and design the 1-D and 2-D structures for various loading conditions. **CO4:**Analyse and design the space structures for various loading conditions. **CO5:** Analyze and design the beams in a residential building. **CO6:**Analyse and design the industrial structures.

8	Geotechnical Engineering Lab [GTE(P)] (CE311)	**CO1:**Determine the index properties of soils. **CO2:** Classify the soil for engineering applications. **CO3:** Determine the permeability and shear parameters of the soils. **CO4:** Estimate the compaction characteristics and CBR of soils. **CO5:** Report the results of laboratory experiments at professional standard. **CO6:**Analyse the data for real time applications.
9	Environmental Engineering Lab [EE(P)] (CE312)	**CO1:**Perform common environmental experiments relating to water and wastewater quality, and know which tests are appropriate for given environmental problems. **CO2:** Statistically analyze and interpret laboratorial results **CO3:** Understand and use the water and wastewater sampling procedures and sample preservations. **CO4:** Demonstrate the ability to write clear technical laboratorial reports. **CO5:** Able to maintain safety standards in the laboratory.
10	Field Applications In Civil Engineering Lab [FACE(P)](SCCE03)	**CO1:**Practice and construct Brick and Stone Masonry **CO2:** Prepare Mortar and Concrete Volumetrically **CO3:** Study different types of Tiles and lay Tiled Flooring **CO4:** Study the components of Plumbing system and practice **CO5:** Study types of reinforcement and prepare Reinforcement cage for a Beam

B.Tech. CE VII Semester (Scheme :2020)

S.No	Course Name	Course Outcomes
Professional Elective-III		
1	Estimation, Costing And Valuation (ECV) (CE401)	**CO1:**Discuss the approximate estimation methods, detailed estimation and calculates volume of earth work for roads and canals. **CO2:** Prepare the bar bending schedules and estimates the quantity of steel required for beams, lintel cum sunshade, one way slab and specifications for Civil Engineering works **CO3:** Determine the quantities of items of works required for construction of buildings, culverts and septic tank with soak pit. **CO4:** Analyze the rates of various items of construction works. **CO5:** Estimates the value of a property and rent fixation.
	Watershed Management (WM)(CE402)	**CO1:**Analyze the rainfall-runoff data and estimate design flood. **CO2:** Understand the watershed management methods. **CO3:** Understand the principles of soil erosion. **CO4:** Understand the water harvesting techniques. **CO5:** Understand the artificial recharge techniques of ground water.
	Earthquake Engineering (EQE) (CE403)	**CO1:**Understand the earthquake causes & effects of ground motion. **CO2:** Understand the free and damped vibrations, modelling of structures. **CO3:** Understand the structural dynamics, free and forced vibrations. **CO4:** Understand the ductile detailing of reinforced concrete and masonry wall building as per IS Codal provisions.

		CO5: Understand the various earthquake protective systems.
	Advanced Foundation Engineering (AFE) (CE404)	**CO1:**Understand the soil exploration methods and prepare the soil profile required for preliminary design of foundation. **CO2:** Understand the design aspects of foundation and settlement of foundations. **CO3:** Identify the expansive soil and suggest the methods to control its adverse effects on structures. **CO4:** Select the effective and economical ground improvement technique for strengthening of soil. **CO5:** Gain the knowledge about design of deep foundation, such as well foundations and caissons.
Professional Elective-IV		
2	Advanced Structural Design (ASD) (CE405)	**CO1:**Design a flat slab **CO2:** Design a combined footing by limit state method. **CO3:** Design the cantilever and counter fort retaining walls by limit state method. **CO4:** Design the water tanks. **CO5:** Design thedeck slab bridge and bridge bearings.
	Hydro Power Engineering (HPE) (CE406)	**CO1:**Estimate and assess the water power potential. **CO2:** Understand the basic concepts of power plants. **CO3:** Analyze the efficiency of various types of power plants. **CO4:** Understand the basic concepts water conducting systems. **CO5:** Select suitable type of turbine for power stations.
	Pavement Analysis And	**CO1:**Understand the characterization of different

	Design (PAD)(CE407)	pavement materials used for highways and airfields. **CO2:** Understand the behaviour of pavements under various loads. **CO3:** Understand the design of flexible pavements using different approaches. **CO4:** Understand the design of rigid pavements and construction of various joints in CC pavements. **CO5:** Understand the concept of Pavement Management System, pavement failures and its evaluation.
	Bridge Engineering (BE) (CE408)	**CO1:**Understand the classification of bridges and IRC specifications and loadings. **CO2:** Design the box culvert by using working stress method. **CO3:** Design the deck slab bridges for IRC loading. **CO4:** Design the T-beam bridges for IRC loading using working stress method. **CO5:** Design the ball bearings, pad bearings, piers and abutments.
Professional Elective-V		
3	Design And Drawing of Hydraulic Structures (DDHS) (CE409)	**CO1:**Design the components of tank sluice and surplus work of a tank. **CO2:** Design the canal drop and canal regulator cum road bridge. **CO3:** Draw the features of surplus weir and sluice of a tank. **CO4:** Design abutments, wing walls and return walls of irrigation structures. **CO5:** Check the stability of side wall of a sluice barrel and pier of a canal regulator. **CO6:** Draw the features of canal drop, canal regulator cum road bridge and under tunnel.
	Urban Transportation	**CO1:**Understand the urban transportation systems

	Planning (UTP) (CE410)	planning process. **CO2:** Design, conduct and administer surveys to provide the data required for transportation planning. **CO3:** Process the data collected about travel behavior and analyze the data for use in transportation planning. **CO4:** Develop and calibrate modal split, trip generation rates for specific types of land use developments. **CO5:** Adopt the steps that are necessary to complete a long-term transportation plan.
	Rural Water Supply and Onsite Sanitation Systems (RWSS) (CE411)	**CO1:**Identify the problems pertaining to rural water supply and sanitation. **CO2:** Understand the different water supply and sanitation system for rural community. **CO3:** Design low cost treatment system for rural areas. **CO4:** Design low cost waste management systems for rural areas. **CO5:** Plan and design an effluent disposal mechanism.
	Ground Improvement Techniques (GIT) (CE412)	**CO1:**Understand the various ground improvement methods densification of granular soils. **CO2:** Understand the densification methods used in cohesive soils. **CO3:** Understand the grouting techniques and their applications. **CO4:** Understand the geosynthetic materials, functions and applications. **CO5:** Understand the soil reinforcement design principles and ground anchor methods.
Open Elective-III		

4	Multimodal Transportation Engineering (MTE) (OEC401)	**CO1:**Understand the components of urban and rural roads and estimates the capacity and level of service. **CO2:** Understand the components and functions of railway track. **CO3:** Understand the control factors, gradients and geometric design of railway track **CO4:** Understand the various aircraft characteristics and design of runways. **CO5:** Understand the various features in Harbours and Ports, their construction and coastal protection works.
	Air Pollution And Control (APC) (OEC402)	**CO1:** To take up the basic concepts of air pollution. **CO2:** To introduce students to basic concepts of pollution. **CO3:** The contents involved the knowledge of causes of air pollution. **CO4:** The contents involved the knowledge of health related to air pollution. **CO5:** To develop skills relevant to control of air pollution.
	Industrial Robotics (IRT) (OE403)	**CO1:**Understand the basic components of industrial robots. **CO2:** Understand the types of End Effectors and Sensors in robots. **CO3:** Understand the Robot manipulator, forward and inverse kinematics. **CO4:** Understand the programming methods for robots and design considerations of Robot work cell **CO5:** Understand the manufacturing and processing applications of robot.
	Quality & Reliability Engineering (QRE)	**CO1:**Understand the overview of the Total Quality Management system.

	(OEC404)	**CO2:** Understand concepts of customer satisfaction and employee involvement. **CO3:** Apply the appropriate tools and techniques of continuous process improvement for controlling and improving quality. **CO4:** Apply Quality Function Deployment and Bench Marking process for improving a product or process. **CO5:** Understand concept of Reliability Engineering.
	Smart Grid Technologies (SGT) (OEC405)	**CO1:** Understand the basic concepts, components and architecture of smart grid. **CO2:** Understand the various measurement technologies in smart grid. **CO3:** Understand about battery technology and energy storage in smart grid. **CO4:** Understand the Interoperability and control of power grid. **CO5:** Understand the cyber security issues in smart grid.
	Artificial Intelligence & Machine Learning (AIML) (OEC406)	**CO1:**Recognize how foundations laid for Artificial Intelligence. **CO2:** Analyze the search strategies to find solutions to the problems by systematically generating new states. **CO3:** Understand the machine learning concepts and the main steps in a typical machine learning. **CO4:** Design a digit image classifier on MNIST dataset. **CO5:** Analyze various ML training models.
	Distributed Embedded Systems (DES) (OEC407)	**CO1:**Understand the real time environment and applications. **CO2:** Understand System architecture and design of

		Distributed Embedded Systems. **CO3:** Understand inter task management and scheduling. **CO4:** Analyze the network connection of distributed systems. **CO5:** Analyze the working of multiple embedded devices in a distributed network.
	Natural Language Processing (NLP) (OEC408)	**CO1:**Understand the importance of Text Wrangling, Cleansing and POS tagging. **CO2:** Develop a NLP application using the NLTK library. **CO3:** Implement Text classification algorithms using scikit-learn and NLTK. **CO4:** Understand the basics of Tokenizing text using Word Net. **CO5:** Understand the importance of Text feature extraction process.
	Design Thinking (DT) (OEC409)	**CO1:**Recognize the importance of Design Thinking. **CO2:** Identify the steps in Design Thinking process. **CO3:** Identify the difference between creativity and innovation. **CO4:** Evaluate the value of creativity. **CO5:** Formulate specific problem statements of real time issues.
	Cloud, Micro Services & Application (CMSA) (OEC410)	**CO1:**Demonstrate the main concepts of cloud, its characteristics, advantages, key technologies and its various delivery and deployment models. **CO2:** Develop and design an application using various tools in cloud environment. **CO3:** Acquire the basic and important design concepts an disuse of web application development techniques in cloud **CO4:** Structure simple python program for

		developing an application in cloud. **CO5:** Analyze the issue of cloud such as security, energy efficiency and interoperability, and provide an insight into future prospects of computing in the cloud monitoring.
	Blockchain Technologies (BCT) (OEC411)	**CO1:**Understand the basic concepts of Blockchain technology. **CO2:** Interpret the security and risks involved in Blockchain applications. **CO3:** Interpret the types of Blockchain applications and Blockchain solutions. **CO4:** Understand the process of Ethereum Blockchain Implementation. **CO5:** Understand the process of Hyper ledger Blockchain Implementation.
	Agile Methodologies (AM) (OEC412)	**CO1:**Understand the importance of interacting with business stakeholders in determining the requirements for a software system. **CO2:** Analyze iterative software development processes: how to plan them, how to execute them. **CO3:** Identify the impact of social aspects on software development success. **CO4:** Understand Software process improvement as an ongoing task for development teams. **CO5:** Analyze the Agile Metrics and Quality Assurance Activities.
	Augmented Reality & Virtual Reality (ARVR) (OEC413)	**CO1:**Explore the history of spatial computing and design interactions. **CO2:** Understand the foundational principles describing how hardware, computer vision algorithms function. **CO3:** Learn Virtual reality animation and 3D Art optimization.

		CO4: Demonstrate Virtual reality. **CO5:** Introduce to the design of visualization tools.
	Open Elective-IV	
5	Composite Materials (CM) (OEC411)	**CO1:**Identify the properties of fiber and matrix materials used in commercial composites, and its manufacturing techniques. **CO2:** Understand manufacturing methods and their elastic properties of lamina. **CO3:** Analyze the Hooke's law for different type of materials. **CO4:** Understand the elastic behavior of the unidirectional composite. **CO5:** Analyze a laminated plate in bending, including finding laminate properties from lamina.
	Image Processing (IP) (OEC415)	**CO1:**Understand the concepts of image processing system and various operations that can perform on digital images. **CO2:** Understand the image enhancement in spatial and frequency domain. **CO3:** Understand various image restoration techniques. **CO4:** Understand various image compression and segmentation techniques. **CO5:** Understand the various mathematical transforms, color image concepts and processing.
	Mobile Computing (MC) (OEC416)	**CO1:**Learn about the mobile infrastructure, radio resource management, overview of generation 1G to 5G. **CO2**: Illustrate the location management involved in GSM, Mobile IP. **CO3:** Illustrate the transmission, transaction technology involved in mobile. **CO4:** Explore the wireless network in mobile.

		CO5: Discover the cognitive radio networks in mobile.
	Enterprise Systems (ES) (OEC417)	**CO1:**Understand basic elements of Enterprise Systems. **CO2:** Develop skills in understanding architecture. **CO3:** Understand the application patterns. **CO4:** Understand the integration and patterns. **CO5:** Analyze the deployment.
	Modern Web Applications (MWA) (OEC418)	**CO1:**Understand the various steps to design static websites. **CO2:** Develop a Web Page using the HTML5. **CO3:** Apply CSS effectively to create interactive websites. **CO4:** Implement client-side scripting using JavaScript to design dynamic websites. **CO5:** Develop end to end application - web frontend and backend development.
	Cognitive Radio (CR) (OEC419)	**CO1:**Understand the architecture of SDR and management of unlicensed spectrum. **CO2:** Analyze the Aware and Adaptive cognitive radios. **CO3:** Analyze the spectrum awareness and interference avoidance. **CO4:** Understand technical challenges in CR and various spectrum sensing methods. **CO5:** Analyze the OFDM based Cognitive radio and MIMO-OFDM channel estimation.
	Automation & Control (AMC) (OEC420)	**CO1:**Understand the elements of automation principles. **CO2:** Understand the construction and working of pneumatic systems.

		CO3: Understand the working of hydraulic systems. **CO4:** Understand various control techniques in automation. **CO5:** Understand the automated testing and inspection methods in industry.
	Human Resource Management (HRM) (OEC421)	**CO1:**Understand human resource management concept and challenges. **CO2:** Understand human resource system design. **CO3:**Understand Functional Areas of HRM. **CO4:** Understand human resource planning. **CO5:** Understand human resource management in Service Sector.
	Design Patterns (DP) (OEC422)	**CO1:**Understand the usage of design patterns for solving object-oriented design problems. **CO2:** Describe the creational patterns abstract factory, factory method, builder, prototype, and singleton **CO3:** Understand structural patterns: adapter, bridge, composite, decorator, facade, fly weight, proxy. **CO4:** Explain behavioral patterns chain of responsibility, command, interpreter, iterator, mediator, memento, observer, state, strategy, template method, and visitor. **CO5:** Explain the patterns used in solving design problems of Lexi Document Editor.
	Prestressing Systems (PS) (OEC423)	**CO1:**Understand the principles and systems of pre-stressing. **CO2:** Understand the various methods of pretensioning. **CO3:** Understand the various methods of post tensioning. **CO4:** Determine the losses in pre-tensioned and

		post-tensioned members. **CO5:** Analyze the prestressed members with straight, concentric and eccentric tendons.
	Additive Manufacturing Technology (ADMT) (OEC424)	**CO1:**Understand prototyping, and the phases of Rapid prototyping. **CO2:** Understand the rapid prototyping process chain. **CO3:** Understand the functioning of Liquid based rapid prototyping systems. **CO4:** Understand the functioning of Powder based rapid prototyping systems. **CO5:** Understand the Direct methods of Tooling and Indirect methods of Tooling.
	Drone Technology (DT) (OEC425)	**CO1:**Understand the historical development of unmanned aerial vehicles. **CO2:** Understand different drone parts and their contribution for successful flight operation. **CO3:** Identify the battery to be used for UAV application. **CO4:** Understand working of motor that can be used in UAV. **CO5:** Classify different microcontrollers and flight controllers.
	Infrastructure For Smart City Development (ISCD) (OEC426)	**CO1:**Understand the fundamental concepts of smart and sustainable cities. **CO2:** Understand the GIS applications in Smart City Planning. **CO3:** Understand the component of smart cities and dwell into their technological advancement. **CO4:** Understand the involvement of stake holders in the design and implementation of responsive smart cities. **CO5:** Explain the importance of different linkages

		and their defined roles including government, urban planners, universities, city developers and communities.
6	Universal Human Values - II(UHV2)	**CO1:**Develop a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence. **CO2:** Understand the harmony in the human being, family, society and nature/existence. **CO3:** Strengthen of self-reflection. **CO4:** Develop a commitment and courage towards implementing Human values.
7	Advanced Structural Analysis And Design Lab [ASAD(P)] (SCCE04)	**CO1:**Learn about the ETABS, its features and usage **CO2:** Learn about the preprocessing and Processing procedure **CO3:** Learn about the post processing procedure and result interpretation **CO4:** Analyze the beam for various loading conditions **CO5:** Analyze and design the multi-storied building for various types of loads

1.1.1 G. PULLA REDDY ENGINEERING COLLEGE (Autonomous): KURNOOL
Department of Computer Science & Engineering
Scheme 2023 List of Subjects Co's for First Year

S.No.	Course Code	Course Name	CO	Statement
1	CE101	Basic Civil and Mechanical Engineering	CO1	Understand the disciplines of Civil Engineering and appreciate their role in ensuring better society.
			CO2	Understand the basics of Surveying.
			CO3	Understand the basics of Transportation, Water Resources and Environmental Engineering.
			CO4	Understand importance of Mechanical Engineering and engineering materials
			CO5	Understand the basics of manufacturing processes and thermal engineering
			CO6	Understand the working principles of power plants, mechanical power transmission systems, and basics of robotics
2	EE101	PART A: BASIC ELECTRICAL ENGINEERING	CO1	Apply the problem solving concepts associated to DC & AC circuits
			CO2	Understand the fundamental laws, construction and operating principles of DC & AC machines and measuring instruments
			CO3	Understand different energy resources, electricity tariffs and safety measures
3	EE101	PART B: BASIC ELECTRONICS ENGINEERING	CO1	Apply the concept of science and mathematics to understand the working of diodes, transistors and their applications
			CO2	Explain the characteristics of diodes and transistors
			CO3	Familiarize with the number systems, codes, Boolean algebra and logic gates
4	BS105	Chemistry (CHY	CO1	Analyze microscopic chemistry

				in terms of atomic and molecular orbitals and understand the concept of Quantum mechanics.
			CO2	Apply the principle of band diagrams in the application of conductors and semiconductors. Identify & recognize the role of nanomaterials in everyday life.
			CO3	Understand the concept of electrochemistry, distinguishes primary and secondary cell, energy storage devices and electrochemical sensors.
			CO4	Understand the chemistry of polymers, conducting polymers and bio-degradable polymers
			CO5	Understand the principles of spectrometry and summarize the concepts of instrumental methods for separation of solid and liquid mixtures.
5	BS106	Chemistry Laboratory (CHP)	CO1	Determine the strength of an acid present in secondary batteries and analyze the composition of an alloy.
			CO2	Understand and appreciate various analytical methods that acts as a tool in the analysis of Dissolved Oxygen & Iron.
			CO3	Determine the cell constant and conductance of solutions and analyze the preparation of advanced polymer materials.
			CO4	Understand instrumentation methods that act as tools in the analysis of fuels. Understand various spectroscopy methods to analyze simple organic compounds.
6	HU101	Communicative English (CE)	CO1	Write Paragraphs, Summaries and Essays of Topical, Narrative, Descriptive, Analytical and Persuasive Nature.
			CO2	Use appropriate Vocabulary in Technical and General Contexts.

			CO3	Use Grammatically acceptable English in Oral and Written Communication.
			CO4	Comprehend General and Technical Content using various Reading Strategies like Skimming and Scanning.
			CO5	Write Official & Job Application Letters and Resumes.
7	HU102	Communicative English Lab (CEP)	CO1	Understand the different aspects of the English Language Proficiency with emphasis on LSRW skills.
			CO2	Apply Communication Skills through various language learning activities.
			CO3	Analyze the English Speech sounds, Stress, Rhythm, Intonation and syllable division for better listening comprehension and speaking.
			CO4	Evaluate and exhibit professionalism in Debates and Group Discussions.
			CO5	Exhibit team playing & Leadership skills.
8	CS102	Computer Programming Lab (CPP)	CO1	Read, understand, and trace the execution of programs written in C language.
			CO2	Select the right control structure for solving the problem.
			CO3	Develop C programs which utilize memory efficiently using programming constructs like pointers.
			CO4	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.
9	EE102	PART A: ELECTRICAL ENGINEERING LAB	CO1	Verify basic laws and measure the electrical parameters
			CO2	Apply the theoretical concepts and operating principles to Electrical Machines
			CO3	Estimate the total energy consumption in domestic

				premises
			CO4	Use various tools for learning, including additional web resources, video lectures and animated demonstrations
10	EE102	PART B: ELECTRONICS ENGINEERING LAB	CO1	Identify & testing of various electronic components
			CO2	Understand the usage of electronic measuring instruments
			CO3	Plot and discuss the characteristics of various electron devices
			CO4	Explain the operation of a digital circuit
			CO5	Use various tools for learning, including additional web resources, video lectures and animated demonstrations
11	ME101	Engineering Graphics (EG)	CO1	Understand the basic principles of engineering drawing and to construct engineering curves and scales
			CO2	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views
			CO3	Understand and draw projection of solids in first quadrant
			CO4	Draw the sectional views of solids in simple position and development of surface of regular solids.
			CO5	Draw Isometric views from orthographic views and orthographic views from isometric views of simple solids
12	BS103	Engineering Physics (EP)	CO1	Analyze the intensity variation of light due to interference, diffraction and polarization.
			CO2	Familiarize with the basics of crystals and their structures.
			CO3	Summarize various types of polarization of dielectrics and classify the magnetic materials.
			CO4	Explain basic concepts of quantum mechanics and apply

				to one dimensional motion of particles and understand the properties and synthesis of nanomaterials.
			CO5	Understand fundamentals of semiconductors and superconductors.
13	BS104	Engineering Physics Lab (EPP)	CO1	Operate optical instruments like travelling microscope and spectrometer.
			CO2	Estimate the wavelengths of different colours using diffraction grating.
			CO3	Plot the intensity of the magnetic field of circular coil carrying current with distance.
			CO4	Evaluate Coericivity, retentivity and magnetic permeability for magnetic materials.
			CO5	Estimate the Numerical Aperture of an optical fiber.
			CO6	Identify the type of semiconductor using Hall effect.
14	ME102	Engineering Workshop (EWP)	CO1	Understand the usage of tools and equipments in work shop trades.
			CO2	Prepare simple models in carpentry and fitting.
			CO3	Prepare electrical connections in house wiring and perform soldering on circuit boards.
			CO4	Prepare sand mould using foundry tools and make simple models in smithy.
			CO5	Understand the Arc and Gas welding processes.
			CO6	Understand the sheet metal processes and plumbing.
15	CS101	Introduction to Programming (INP)	CO1	Understand basics of Computers, Algorithmic thinking and Basic constructs of 'C'.
			CO2	Apply control structures for solving a problem.
			CO3	Demonstrate the concepts of Arrays and Strings to solve problems.

			CO4	Define User defined data types & Pointers and use them in problem solving.
			CO5	Implement function oriented programming and basic file operations.
16	CS103	IT Workshop (ITWP)	CO1	Understand Hardware components and inter dependencies.
			CO2	Perform installation of Windows, Linux and BOSS operating systems.
			CO3	Demonstrate the working of web browsers, search engines and maintain cyber hygiene.
			CO4	Prepare documents using MSWord and Latex.
			CO5	Perform calculations on spread sheets using Excel.
			CO6	Prepare presentations using Power Point.
			CO7	Interact with the Chat GPT- AI tool.
17	BS101	Linear Algebra & Calculus (LAC)	CO1	Develop and use of matrix algebra techniques that are needed by engineers for practical applications.
			CO2	Calculate Eigen values and Eigen vectors of matrices.
			CO3	Utilize mean value theorems and functions of several variables to real life problems.
			CO4	Learn important tools of calculus in higher dimensions.
			CO5	Familiarize with double and triple integrals of functions of several variables in two dimensions using
18	CS104	Data Structures (DS)	CO1	Understand the importance of Data Structures and Implement Array operations.
			CO2	Implement operations of Linked List for dynamic memory management.
			CO3	Develop programs to implement Stack and its applications.
			CO4	Develop programs to implement Queue and its applications.

			CO5	Understand the operations of Binary Search Tree & Hashing techniques.
19	CS105	Data Structures Lab (DSP)	CO1	Implement operations of an Array and perform searching and sorting.
			CO2	Implement operations of linked list for dynamic memory management.
			CO3	Develop programs using stacks to handle recursive algorithms.
			CO4	Develop programs to implement queues and using them for efficient task scheduling and Breadth-first traversal in graphs.
			CO5	Implement operations of Binary Search Tree and simple hashing techniques.
20	BS102	Differential Equations & Vector Calculus (DEVC)	CO1	Solve the first order ordinary differential equations related to various engineering fields.
			CO2	Solve the higher order ordinary differential equations and its applications.
			CO3	Identify solution methods for partial differential equations that model physical processes.
			CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence.
			CO5	Estimate the work done against a field, circulation and flux using vector calculus
21	BS107	Engineering Chemistry (EC)	CO1	Describes the water quality issues for steam generation in the boilers and problems associated with treatment.
			CO2	Understand the corrosion prevention methods and factors affecting corrosion.
			CO3	Understand the chemistry of plastics, elastomers and conducting polymers.
			CO4	Judge the quality of coal, petrol and alternate fuels.
			CO5	Illustrate the concepts of colloids, micelle and

				nanomaterials.
22	BS108	Engineering Chemistry Lab (ECP)	CO1	Determine the strength of an acid present in secondary batteries and analyze the composition of an alloy.
			CO2	Determine the hardness and dissolved oxygen present in water.
			CO3	Estimate the Iron and Calcium in cement and prepare polymer & nanomaterials.
			CO4	Understand instrumentation methods that act as tools in the analysis of different fuels.
23	EE103	Electrical Circuit Analysis-1 (ECA-1)	CO1	Apply circuit reduction techniques and methods to find the parameters of circuit
			CO2	Understand the concepts of magnetic circuits
			CO3	Analyze study state response of single phase R-L-C circuits
			CO4	Understand the concepts of resonance and locus diagrams
			CO5	Apply network thermos to electrical circuits
24	EE104	Electrical Circuits Lab (ECP)	CO1	Verify basic laws and measure the electrical parameters
			CO2	Apply network theorems to electrical circuits
			CO3	Draw the frequency response curve and locus diagrams of R-L-C circuits
			CO4	Use various tools for learning, including additional web resources, video lectures and animated demonstrations
25	CE102	Engineering Mechanics (EGM)	CO1	Calculate the resultant of different force systems and understand the concept of friction.
			CO2	Determine the forces in determinate structures and axial forces in trusses using equilibrium conditions and principle of virtual work.
			CO3	Calculate the centroids, center of gravity, and moment of inertia of different geometrical

				shapes.
			CO4	Apply the principles of work energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.
			CO5	Solve the problems involving the translational and rotational motion of rigid bodies.
26	CE103	Engineering Mechanics & Building Practices Lab (EMBP)	CO1	Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.
			CO2	Verify the law of parallelogram of forces and law of moment using a force polygon and bell crank lever.
			CO3	Determine the centre of gravity of different configurations.
			CO4	Understand the quality testing and assessment procedures and principles of nondestructive testing.
			CO5	Exposure to safety practices in the construction industry.
27	CE104	Engineering Mechanics Lab (EGMP)	CO1	Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.
			CO2	Verify the law of parallelogram of forces and law of moment using a force polygon and bell crank lever.
			CO3	Determine the center of gravity and moment of inertia of different configurations.
			CO4	Verify the equilibrium conditions of a rigid body under the action of different force systems.
28	EC101	Network Analysis (NA)	CO1	Apply circuit analysis techniques and theorems to find the parameters
			CO2	Determine the transient response of R-L-C circuits using differential equation & Laplace transform approach
			CO3	Analyze the steady state

				response of single phase R-L-C circuits & network transformations
			CO4	Understand the concepts of resonance & coupled circuits
			CO5	Determine the network parameters.
29	EC102	Network Analysis & Simulation Lab (NASP)	CO1	Verify basic laws and measure the electrical parameters.
			CO2	Apply network theorems to electrical circuits.
			CO3	Understand the frequency response of R-L-C circuits.
			CO4	Determine the network parameters.
			CO5	Use various tools for learning, including additional web resources, video lectures and animated demonstrations.