

**DEPARTMENT OF COMPUTER SCIENCE ENGINEERING**

**SEMESTER III**

| SL NO | COURSE CODE | COURSE NAME                      | CO No. | CO DESCRIPTION  |
|-------|-------------|----------------------------------|--------|---|
| 1     | MAT203      | DISCRETE MATHEMATICAL STRUCTURES | 1      | Check the validity of predicates in Propositional and Quantified Propositional Logic using truth tables, deductive reasoning and inference theory on Propositional Logic  |
|       |             |                                  | 2      | Solve counting problems by applying the elementary counting techniques - Rule of Sum, Rule of Product, Permutation, Combination, Binomial Theorem, Pigeonhole Principle and Principle of Inclusion and Exclusion              |
|       |             |                                  | 3      | Classify binary relations into various types and illustrate an application for each type of binary relation, in Computer Science  |
|       |             |                                  | 4      | Illustrate an application for Partially Ordered Sets and Complete Lattices, in Computer Science   |
|       |             |                                  | 5      | Explain Generating Functions and solve First Order and Second Order Linear Recurrence Relations with Constant Coefficients  |
|       |             |                                  | 6      | Illustrate the abstract algebraic systems - Semigroups, Monoids, Groups, Homomorphism and Isomorphism of Monoids and Groups   |
| 2     | CST201      | DATA STRUCTURES                  | 1      | Design an algorithm for a computational task and calculate the time/space complexities of that algorithm  |
|       |             |                                  | 2      | Identify the suitable data structure (array or linked list) to represent a data item required to be processed to solve a given computational problem and write an algorithm to find the solution of the computational problem |
|       |             |                                  | 3      | Write an algorithm to find the solution of a computational problem by selecting an appropriate data structure (binary tree/graph) to represent a data item to be processed  |
|       |             |                                  | 4      | Store a given dataset using an appropriate Hash Function to enable efficient access of data in the given set  |
|       |             |                                  | 5      | Select appropriate sorting algorithms to be used in specific circumstances  |
|       |             |                                  | 6      | Design and implement Data Structures for solving real world problems efficiently  |

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| 3 | CST203  | LOGIC SYSTEM DESIGN                       | 1 | Illustrate decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers |
|   |         |   | 2 | Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates   |
|   |         |   | 3 | Design combinational circuits - Adders, Code Convertors, Decoders, Magnitude Comparators, Parity Generator/Checker and design the Programmable Logic Devices - ROM and PLA.   |
|   |         |   | 4 | Design sequential circuits - Registers, Counters and Shift Registers.   |
|   |         |   | 5 | Use algorithms to perform addition and subtraction on binary, BCD and floating point numbers  |
| 4 | CST205  | OBJECT ORIENTED PROGRAMMING USING JAVA    | 1 | Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism  |
|   |         |   | 2 | Utilise datatypes, operators, control statements, built in packages & interfaces, Input/ Output Streams and Files in Java to develop programs   |
|   |         |   | 3 | Illustrate how robust programs can be written in Java using exception handling mechanism  |
|   |         |   | 4 | Write application programs in Java using multithreading and database connectivity   |
|   |         |   | 5 | Write Graphical User Interface based application programs by utilising event handling features and Swing in Java.   |
| 5 | CSL 201 | DATA STRUCTURES LAB                       | 1 | Write a time/space efficient program using arrays/linked lists/trees/graphs to provide necessary functionalities meeting a given set of user requirements   |
|   |         |   | 2 | Write a time/space efficient program to sort a list of records based on a given key in the record   |
|   |         |   | 3 | Examine a given Data Structure to determine its space complexity and time complexities of operations on it  |
|   |         |   | 4 | Design and implement an efficient data structure to represent given data  |
|   |         |   | 5 | Write a program using linked lists to simulate Memory Allocation and Garbage Collection   |
| 6 | CSL 203 | OBJECT ORIENTED PROGRAMMING LAB (IN JAVA) | 1 | Implement the Object Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java  |
|   |         |   | 2 | Implement programs in Java which use datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and Files   |
|   |         |   | 3 | Implement robust application programs in Java using exception handling  |
|   |         |   | 4 | Implement application programs in Java using multithreading and database connectivity   |
|   |         |   | 5 | Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java  |

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| 7 | HUT 200 | PROFESSIONAL ETHICS     | 1 | Understand the core values that shape the ethical behaviour of a professional.                                |
|   |         |                         | 2 | Adopt a good character and follow an ethical life.  |
|   |         |                         | 3 | Explain the role and responsibility in technological development by keeping personal ethics and legal ethics. |
|   |         |                         | 4 | Solve moral and ethical problems through exploration and assessment by established experiments.               |
|   |         |                         | 5 | Apply the knowledge of human values and social values to contemporary ethical values and global issues.       |
| 8 | MCN201  | SUSTAINABLE ENGINEERING | 1 | Understand the relevance and the concept of sustainability and the global initiatives in this direction       |
|   |         |                         | 2 | Explain the different types of environmental pollution problems and their sustainable solutions               |
|   |         |                         | 3 | Discuss the environmental regulations and standards   |
|   |         |                         | 4 | Outline the concepts related to conventional and non- conventional energy                                     |
|   |         |                         | 5 | Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles  |

#### SEMESTER IV

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|---|--------|--------------|---|---|
| 1 | MAT206 | GRAPH THEORY | 1 | Explain vertices and their properties, types of paths, classification of graphs and trees & their properties.   |
|   |        |              | 2 | Demonstrate the fundamental theorems on Eulerian and Hamiltonian graphs.  |
|   |        |              | 3 | Illustrate the working of Prim's and Kruskal's algorithms for finding minimum cost spanning tree and Dijkstra's and Floyd-Warshall algorithms for finding shortest paths. |
|   |        |              | 4 | Explain planar graphs, their properties and an application for planar graphs.   |
|   |        |              | 5 | Illustrate how one can represent a graph in a computer.   |
|   |        |              | 6 | Explain the Vertex Color problem in graphs and illustrate an example application for vertex coloring.   |

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| 2 | CST 202 | COMPUTER ORGANIZATION AND ARCHITECTURE | 1 | Recognize and express the relevance of basic components, I/O organization and pipelining schemes in a digital computer                            |
|   |         |  | 2 | Explain the types of memory systems and mapping functions used in memory systems  |
|   |         |  | 3 | Demonstrate the control signals required for the execution of a given instruction   |
|   |         |  | 4 | Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it   |
|   |         |  | 5 | Explain the implementation aspects of arithmetic algorithms in a digital computer   |
|   |         |  | 6 | Develop the control logic for a given arithmetic problem  |
| 3 | CST204  | DATABASE MANAGEMENT SYSTEMS            | 1 | Summarize and exemplify fundamental nature and characteristics of database systems  |
|   |         |  | 2 | Model real word scenarios given as informal descriptions, using Entity Relationship diagrams.   |
|   |         |  | 3 | Model and design solutions for efficiently representing and querying data using relational model  |
|   |         |  | 4 | Demonstrate the features of indexing and hashing in database applications   |
|   |         |  | 5 | Discuss and compare the aspects of Concurrency Control and Recovery in Database systems   |
|   |         |  | 6 | Explain various types of NoSQL databases  |
| 4 | CST206  | OPERATING SYSTEMS                      | 1 | Explain the relevance, structure and functions of Operating Systems in computing devices.   |
|   |         |  | 2 | Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems.                                    |
|   |         |  | 3 | Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors |
|   |         |  | 4 | Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems.                             |
|   |         |  | 5 | Explain the memory management algorithms in Operating Systems.  |
|   |         |  | 6 | Explain the security aspects and algorithms for file and storage management in Operating Systems.   |

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| 5 | EST200  | DESIGN & ENGINEERING  | 1 | Explain the different concepts and principles involved in design engineering.   |
|   |         |                       | 2 | Apply design thinking while learning and practicing engineering.  |
|   |         |                       | 3 | Develop innovative, reliable, sustainable, and economically viable designs incorporating knowledge in engineering.            |
| 6 | MCN202  | CONSTITUTION OF INDIA | 1 | Explain the background of the present constitution of India and features.   |
|   |         |                       | 2 | Utilize the fundamental rights and duties.  |
|   |         |                       | 3 | Understand the working of the union executive, parliament and judiciary.  |
|   |         |                       | 4 | Understand the working of the state executive, legislature and judiciary.   |
|   |         |                       | 5 | Utilize the special provisions and statutory institutions.  |
|   |         |                       | 6 | Show national and patriotic spirit as responsible citizens of the country   |
| 7 | CSL 202 | DIGITAL LAB           | 1 | Design and implement combinational logic circuits using Logic Gates   |
|   |         |                       | 2 | Design and implement sequential logic circuits using Integrated Circuits  |
|   |         |                       | 3 | Simulate functioning of digital circuits using programs written in a Hardware Description Language                            |
|   |         |                       | 4 | Function effectively as an individual and in a team to accomplish a given task of designing and implementing digital circuits |
| 8 | CSL 206 | OPERATING SYSTEMS LAB | 1 | Illustrate the use of systems calls in Operating Systems.   |
|   |         |                       | 2 | Implement Process Creation and Inter Process Communication in Operating Systems.  |
|   |         |                       | 3 | Implement First Come First Served, Shortest Job First, Round Robin and Priority- based CPU Scheduling Algorithms.             |
|   |         |                       | 4 | Illustrate the performance of First In First Out, Least Recently Used and Least Frequently Used Page Replacement Algorithms.  |
|   |         |                       | 5 | Implement modules for Deadlock Detection and Deadlock Avoidance in Operating Systems.   |
|   |         |                       | 6 | Implement modules for Storage Management and Disk Scheduling in Operating Systems.  |

**SEMESTER V**

|   |        |                                      |   |   |
|---|--------|--------------------------------------|---|---|
| 1 | CST301 | FORMAL LANGUAGES AND AUTOMATA THEORY | 1 | Classify a given formal language into Regular, Context-Free, Context Sensitive, Recursive or Recursively Enumerable.                                    |
|   |        |                                      | 2 | Explain a formal representation of a given regular language as a finite state automaton, regular grammar, regular expression and Myhill-Nerode relation |
|   |        |                                      | 3 | Design a Pushdown Automaton and a Context-Free Grammar for a given context-free language.   |
|   |        |                                      | 4 | Design Turing machines as language acceptors or transducers.  |
|   |        |                                      | 5 | Explain the notion of decidability.   |
| 2 | CST303 | COMPUTER NETWORKS                    | 1 | Explain the features of computer networks, protocols, and network design models   |
|   |        |                                      | 2 | Describe the fundamental characteristics of the physical layer and identify the usage in network communication  |
|   |        |                                      | 3 | Explain the design issues of data link layer, link layer protocols, bridges and switches  |
|   |        |                                      | 4 | Illustrate wired LAN protocols (IEEE 802.3) and wireless LAN protocols (IEEE 802.11)  |
|   |        |                                      | 5 | Select appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for a network                                 |
|   |        |                                      | 6 | Illustrate the functions and protocols of the network layer, transport layer, and application layer in inter-networking                                 |
| 3 | CST305 | SOFTWARE SYSTEMS                     | 1 | Distinguish softwares into system and application software categories.  |
|   |        |                                      | 2 | Identify standard and extended architectural features of machines.  |
|   |        |                                      | 3 | Identify machine dependent features of system software  |
|   |        |                                      | 4 | Identify machine independent features of system software.   |
|   |        |                                      | 5 | Design algorithms for system softwares and analyze the effect of data structures.   |
|   |        |                                      | 6 | Understand the features of device drivers and editing & debugging tools.  |

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| 4 | CST307 | MICROPROCESSORS AND MICROCONTROLLERS | 1 | Illustrate the architecture, modes of operation and addressing modes of microprocessors   |
|   |        |                                      | 2 | Develop 8086 assembly language programs.  |
|   |        |                                      | 3 | Demonstrate interrupts, its handling and programming in 8086.   |
|   |        |                                      | 4 | Illustrate how different peripherals (8255,8254,8257) and memory are interfaced with microprocessors.   |
|   |        |                                      | 5 | Outline features of microcontrollers and develop low level programs.  |
| 5 | CST309 | MANAGEMENT OF SOFTWARE SYSTEMS       | 1 | Demonstrate Traditional and Agile Software Development approaches   |
|   |        |                                      | 2 | Prepare Software Requirement Specification and Software Design for a given problem.   |
|   |        |                                      | 3 | Justify the significance of design patterns and licensing terms in software development, prepare testing, maintenance and Develops strategies for a project.              |
|   |        |                                      | 4 | Make use of software project management concepts while planning, estimation, scheduling, tracking and change management of a project, with a traditional/agile framework. |
|   |        |                                      | 5 | Utilize SQA practices, Process Improvement techniques and Technology advancements in cloud based software models and containers & microservices.                          |
| 6 | MCN301 | DISASTER MANAGEMENT                  | 1 | Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle                 |
|   |        |                                      | 2 | Distinguish between different hazard types and vulnerability types and do vulnerability assessment  |
|   |        |                                      | 3 | Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk   |
|   |        |                                      | 4 | Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community                       |
|   |        |                                      | 5 | Identify factors that determine the nature of disaster response and discuss the various disaster response actions   |
|   |        |                                      | 6 | Explain the various legislations and best practices for disaster management and risk reduction at national and international level  |

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| 7 | CSL331 | SYSTEM SOFTWARE AND MICROPROCESSOR LAB | 1 | Develop 8086 programs and execute it using a microprocessor kit.   |
|   |        |  | 2 | Develop 8086 programs and, debug and execute it using MASM assemblers  |
|   |        |  | 3 | Develop and execute programs to interface stepper motor, 8255, 8279 and digital to analog converters with 8086 trainer kit |
|   |        |  | 4 | Implement and execute different scheduling and paging algorithms in OS   |
|   |        |  | 5 | Design and implement assemblers, Loaders and macroprocessors.  |
| 8 | CSL333 | DATABASE MANAGEMENT SYSTEMS LAB        | 1 | Design database schema for a given real world problem-domain using standard design and modeling approaches.                |
|   |        |  | 2 | Construct queries using SQL for database creation, interaction, modification, and updation.                                |
|   |        |  | 3 | Design and implement triggers and cursors.   |
|   |        |  | 4 | Implement procedures, functions, and control structures using PL/SQL.  |
|   |        |  | 5 | Perform CRUD operations in NoSQL Databases.  |
|   |        |  | 6 | Develop database applications using front-end tools and back-end DBMS.   |

#### SEMESTER VI

|   |        |                 |   |   |
|---|--------|-----------------|---|---|
| 1 | CST302 | COMPILER DESIGN | 1 | Explain the phases in compilation process(lexical analysis, syntax analysis, semantic analysis, intermediate code generation, code optimization and code generation) and model a lexical analyzer |
|   |        |                 | 2 | Model language syntax using Context Free Grammar and develop parse tree representation using leftmost and rightmost derivations   |
|   |        |                 | 3 | Compare different types of parsers(Bottom-up and Top-down) and construct parser for a given grammar   |
|   |        |                 | 4 | Build Syntax Directed Translation for a context free grammar, compare various storage allocation strategies and classify intermediate representations   |
|   |        |                 | 5 | Illustrate code optimization and code generation techniques in compilation  |



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| 2 | CST304 | COMPUTER GRAPHICS AND IMAGE PROCESSING | 1 | Describe the working principles of graphics devices   |
|   |        |  | 2 | Illustrate line drawing, circle drawing and polygon filling algorithms  |
|   |        |  | 3 | Demonstrate geometric representations, transformations on 2D & 3D objects, clipping algorithms and projection algorithms                              |
|   |        |  | 4 | Summarize visible surface detection methods   |
|   |        |  | 5 | Summarize the concepts of digital image representation, processing and demonstrate pixel relationships  |
|   |        |  | 6 | Solve image enhancement and segmentation problems using spatial domain techniques   |
| 3 | CST306 | ALGORITHM ANALYSIS AND DESIGN          | 1 | Analyze any given algorithm and express its time and space complexities in asymptotic notations.  |
|   |        |  | 2 | Derive recurrence equations and solve it using Iteration, Recurrence Tree, Substitution and Master's Method to compute time complexity of algorithms. |
|   |        |  | 3 | Illustrate Graph traversal algorithms & applications and Advanced Data structures like AVL trees and Disjoint set operations.                         |
|   |        |  | 4 | Demonstrate Divide-and-conquer, Greedy Strategy, Dynamic programming, Branch-and Bound and Backtracking algorithm design techniques                   |
|   |        |  | 5 | Classify a problem as computationally tractable or intractable, and discuss strategies to address intractability                                      |
|   |        |  | 6 | Identify the suitable design strategy to solve a given problem.   |
| 4 | CST322 | DATA ANALYTICS                         | 1 | Illustrate the mathematical concepts for data analytics   |
|   |        |  | 2 | Explain the basic concepts of data analytics  |
|   |        |  | 3 | Illustrate various predictive and descriptive analytics algorithms  |
|   |        |  | 4 | Describe the key concepts and applications of Big Data Analytics  |
|   |        |  | 5 | Demonstrate the usage of Map Reduce paradigm for Big Data Analytics   |
|   |        |  | 6 | Use R programming tool to perform data analysis and visualization   |

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| 5 | HUT300  | INDUSTRIAL ECONOMICS & FOREIGN TRADE |   | Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare.                              |
|   |         |                                      | 2 | Take appropriate decisions regarding volume of output and to evaluate the social cost of production.   |
|   |         |                                      | 3 | Determine the functional requirement of a firm under various competitive conditions.   |
|   |         |                                      | 4 | Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society.                                       |
|   |         |                                      | 5 | Determine the impact of changes in global economic policies on the business opportunities of a firm.   |
| 6 | CST 308 | COMPREHENSIVE COURSE WORK            | 1 | Comprehend the concepts of discrete mathematical structures  |
|   |         |                                      | 2 | Comprehend the concepts and applications of data structures  |
|   |         |                                      | 3 | Comprehend the concepts, functions and algorithms in Operating System  |
|   |         |                                      | 4 | Comprehend the organization and architecture of computer systems   |
|   |         |                                      | 5 | Comprehend the fundamental principles of database design and manipulation  |
|   |         |                                      | 6 | Comprehend the concepts in formal languages and automata theory  |
| 7 | CSL 332 | NETWORKING LAB                       | 1 | Use network related commands and configuration files in Linux Operating System.  |
|   |         |                                      | 2 | Develop network application programs and protocols.  |
|   |         |                                      | 3 | Analyze network traffic using network monitoring tools.  |
|   |         |                                      | 4 | Design and setup a network and configure different network protocols.  |
|   |         |                                      | 5 | Develop simulation of fundamental network concepts using a network simulator.  |
| 8 | CSD334  | MINI PROJECT                         | 1 | Identify technically and economically feasible problems  |
|   |         |                                      | 2 | Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes  |
|   |         |                                      | 3 | Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques |
|   |         |                                      | 4 | Prepare technical report and deliver presentation  |
|   |         |                                      | 5 | Apply engineering and management principles to achieve the goal of the project   |

**SEMESTER VII**

|   |         |                         |   |  |
|---|---------|-------------------------|---|--|
| 1 | CST 401 | ARTIFICIAL INTELLIGENCE | 1 | Explain the concepts of intelligent system and their architecture.                               |
|   |         |                         | 2 | Illustrate uninformed and informed search techniques for problem solving in intelligent systems. |
|   |         |                         | 3 | Solve constraint satisfaction problems using search techniques.                                  |
|   |         |                         | 4 | Represent AI domain knowledge using logic systems and use inference techniques                   |
|   |         |                         | 5 | Illustrate different types of learning techniques used in inyelligent systems.                   |
| 2 | CST423  | CLOUD COMPUTING         | 1 | Explain the various cloud computing models and services  |
|   |         |                         | 2 | Demonstrate the significance of implementing virtualization techniques                           |
|   |         |                         | 3 | Explain different cloud enabling technologies and compare private cloud platforms.               |
|   |         |                         | 4 | Apply appropriate cloud programming methods to solve big data problems.                          |
|   |         |                         | 5 | Describe the need for security mechanisms in cloud.  |
|   |         |                         | 6 | Compare the different popular cloud computing platforms  |
| 3 | CSL411  | COMPILER LAB            | 1 | Implement lexical analyzer using the tool LEX.   |
|   |         |                         | 2 | Implement syntax analyzer using the tool YACC.   |
|   |         |                         | 3 | Design NFA and DFA for a problem and write programs to perform operations on it                  |
|   |         |                         | 4 | Design and implement Top-down parsers  |
|   |         |                         | 5 | Design and implement Bottom-Up parsers.  |
|   |         |                         | 6 | Implement intermediate code for expressions.   |

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| 4 | CSQ413 | SEMINAR           | 1 | Identify academic documents from the literature which are related to her/his areas of interest.                        |
|   |        |                   | 2 | Read and apprehend an academic document from the literature which is related to her/his areas of interest.             |
|   |        |                   | 3 | Prepare presentations about an academic document   |
|   |        |                   | 4 | Give presentations about an academic document  |
|   |        |                   | 5 | Prepare a technical report   |
| 5 | CSD415 | PROJECT PHASE I   | 1 | Model and solve real world problems by applying knowledge across domains   |
|   |        |                   | 2 | Develop products, processes or technologies for sustainable and socially relevant applications.                        |
|   |        |                   | 3 | Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks. |
|   |        |                   | 4 | Plan and execute tasks utilizing available resources within timeline following ethical and professional norms          |
|   |        |                   | 5 | Identify technology/research gaps and propose innovative solutions   |
|   |        |                   | 6 | Organize and communicate technical and scientific findings effectively in written and oral forms.                      |
| 6 | EET455 | ENERGY MANAGEMENT | 1 | Explain the significance and procedure for energy management and audit.  |
|   |        |                   | 2 | Discuss the energy efficiency and management of electrical loads.  |
|   |        |                   | 3 | Discuss the energy efficiency in boilers and furnaces.   |
|   |        |                   | 4 | Explain the energy management opportunities in HVAC systems  |
|   |        |                   | 5 | Compute the economic feasibility of the energy conservation measures.  |

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| 7 | MCN 401 | INDUSTRIAL SAFETY<br>ENGINEERING |   | Describe the theories of accident causation and preventive measures of industrial accidents                                      |
|   |         |                                  | 2 | Explain about personal protective equipments, its selection, safety performance and indicators and importance of housekeeping    |
|   |         |                                  | 3 | Explain different issues in construction industries  |
|   |         |                                  | 4 | Describe various hazards associated with different machines and mechanical material handling                                     |
|   |         |                                  | 5 | Utilise different hazards identification tools in different industries with the knowledge of different types of chemical hazards |

**SEMESTER VIII**

|   |        |                               |   |  |
|---|--------|-------------------------------|---|--|
| 1 | CST402 | DISTRIBUTED COMPUTING         | 1 | Summarize various aspects of distributed computation model and logical time.                             |
|   |        |                               | 2 | Illustrate election algorithm, global snapshot algorithm and termination detection algorithm.            |
|   |        |                               | 3 | Compare token based, non-token based and quorum based mutual exclusion algorithms.                       |
|   |        |                               | 4 | Recognize the significance of deadlock detection and shared memory in distributed systems.               |
|   |        |                               | 5 | Explain the concepts of failure recovery and consensus   |
|   |        |                               | 6 | Illustrate distributed file system architectures.  |
| 2 | CST434 | NETWORK SECURITY<br>PROTOCOLS | 1 | Explain authentication protocols, X.509 authentication service and Public Key Infrastructure (PKI).      |
|   |        |                               | 2 | Identify the security mechanisms in E mail security services.  |
|   |        |                               | 3 | Summarize the network and transport layer security services provided in a secure communication scenario. |
|   |        |                               | 4 | Describe real time communication security and application layer security protocols.                      |
|   |        |                               | 5 | Explain the concepts of firewalls and wireless network security.   |

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| 3 | CST476 | MOBILE COMPUTING          | 1 | Explain the various mobile computing applications, services, design considerations and architectures                                     |
|   |        |                           | 2 | Describe the various technology trends for next generation cellular wireless networks and use the spreading concept on data transmission |
|   |        |                           | 3 | Summarize the architecture of various wireless LAN technologies  |
|   |        |                           | 4 | Identify the functionalities of mobile network layer and transport layer   |
|   |        |                           | 5 | Explain the features of Wireless Application Protocol  |
|   |        |                           | 6 | Interpret the security issues in mobile computing and next generation technologies   |
| 4 | CST428 | BLOCKCHAIN TECHNOLOGIES   | 1 | Illustrate the cryptographic building blocks of blockchain technology.   |
|   |        |                           | 2 | Explain the fundamental concepts of blockchain technology.   |
|   |        |                           | 3 | Summarize the classification of consensus algorithms   |
|   |        |                           | 4 | Explain the concepts of first decentralized cryptocurrency bitcoin.  |
|   |        |                           | 5 | Explain the use of smart contracts and its use cases.  |
|   |        |                           | 6 | Develop simple applications using Solidity language on Ethereum platform.  |
| 5 | CSD416 | PROJECT PHASE II          | 1 | Model and solve real world problems by applying knowledge across domains   |
|   |        |                           | 2 | Develop products, processes or technologies for sustainable and socially relevant applications   |
|   |        |                           | 3 | Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks                    |
|   |        |                           | 4 | Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms                          |
|   |        |                           | 5 | Identify technology/research gaps and propose innovative/creative solutions  |
|   |        |                           | 6 | Organize and communicate technical and scientific findings effectively in written and oral forms   |
| 6 | CST404 | COMPREHENSIVE COURSE VIVA | 1 | Competent in placement tests and other competitive examinations.   |