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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COURSE	C.O CODE	COURSE OUTCOME DESCRIPTION
DATA STRUCTURES	**C211.1**	Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithm.
	C211.2	Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing.
	C211.3	Demonstrate different methods for traversing trees and Graphs.
	C211.4	Solve various algorithm design techniques for developing algorithms.
ELEMENTS OF ELECTRONICS ENGINEERING	**C212.1**	Define and acquire knowledge on semiconductor physics.
	C212.2	Illustrate the structure, creation of electric field and working of PN Junction Semiconductor Diodes.
	C212.3	Describe the various modes of operation of transistors (BJT), FETs, MOSFETs.
	C212.4	Develop the capability to analyse simple electronic circuits using diodes, transistors and FETs.
DISCRETE MATHEMATICAL STRUCTURES	**C213.1**	Apply the mathematical logic to solve problems.
	C213.2	Apply the Counting techniques to solve Combinatorial Problems and Recurrence relations.
	C213.3	Analyze the various properties of relations.
	C213.4	Solve the real-world problems using graph and trees.
	C213.5	Evaluate the Boolean algebra and Finite State Machines.

COURSE	C.O CODE	COURSE OUTCOME DESCRIPTION
OBJECT ORIENTED PROGRAMMING	**C214.1**	Develop essential programming skills in computer programming concepts in C++ language.
	C214.2	Apply the basics of programming in the C++ language.
	C214.3	To apply various object-oriented features inheritance, data abstraction,encapsulation, constructors, destructors and polymorphism to solve various computing problems using C++ language.
	C214.4	To apply virtual functions and file concepts in C++ language.
	C214.5	To apply templates and exception handling in C++ language.
ELEMENTS OF ELECTRICAL ENGINEERING	**C215.1**	To understand the basic concepts of electrical circuits and principles of energy conversions and Earthling Concept.
	C215.2	To understand the construction and working of various Electrical machines.
	C215.3	To analyse the performance characteristics of various Electrical machines byconducting suitable tests and differentiate between machines for various applications
	C215.4	Ability to derive mathematical relations between the design parameters of various machines and develop their Equivalent circuits
	C215.1	To understand the basic concepts of electrical circuits and principles of energy conversions and Earthling Concept.
DIGITAL LOGIC DESIGN	**C216.1**	Define different number systems, binary addition and subtraction, r'scomplement representation and operations with this representation.
	C216.2	Describe different Boolean algebra theorems and apply them for logic functions and able to perform gate level minimization by using K-maps.
	C216.3	Define different combinational circuits .and to be able to build simple circuits.
	C216.4	Analyse storage elements like latches, flip flops and clocked sequential Circuits
	C216.5	Design asynchronous and synchronous sequential circuits, like counters and shift registers.

COURSE	C.O CODE	COURSE OUTCOME DESCRIPTION
DATA STRUCTURES LAB	**C217.1**	Implementation of different operations on stacks, queues and linked list.
	C217.2	Implementation of Different Searching and Sorting techniques.
	C217.3	Implementation of Graph traversal techniques and tree traversal techniques
OBJECT ORIENTED PROGRAMMING LAB	**C218.1**	Develop programming skills in computer programming concepts in C++ language.
	C218.2	Solve coding problems in C++ language.
	C218.3	Solve coding problems related to OOP in C++language.
OPERATING SYSTEMS	**C221.1**	Understands OS evolution, its structure and services provided by it.
	C221.2	Apply process scheduling algorithms, policies and mechanisms, process synchronization; inter process communication, deadlocks and other processsubsystem related concepts.
	C221.3	Apply memory allocation and deallocation policies and mechanism for main and auxiliary memory; file system design and implementation issues.
	C221.4	Investigate UNIX/LINUX and windows OS platforms w.r.t similarities and differences in design philosophies.
COMPUTER ORGANIZATION	**C222.1**	Ability to identify the basic components and design of a computer and Operation of CPU.
	C222.2	Ability to identify the issues involved in the instruction execution and various stages of instruction life stage.
	C222.3	To understand types of addressing modes and Computer Instructions.
	C222.4	Understand how data transfer takes place among the various peripherals in the computer system.
	C222.5	Understand the organization of the memory system and its effect on performance of the computer.
	C222.6	To understand the functionality of Control unit.

COURSE	C.O CODE	COURSE OUTCOME DESCRIPTION
MICROPROCESSORS	**C223.1**	Analyse the architectures of 8085, 8086 microprocessors.
	C223.2	Implement the 8085, 8086 assembly language programs.
	C223.3	Implement the interfacing of memory chip, I/O chip and peripherals, data converters with 8086.
	C223.4	Analyse the architecture of 8051 microcontroller.
	C223.5	Implement the 8051 Assembly language programs
DATA COMMUNICATIONS	**C224.1**	Apply the basic concepts of data communication networking, network protocols, data transmission characteristics.
	C224.2	Apply the transmission media and different types of signal encoding techniques.
	C224.3	Apply the concepts of Synchronous and asynchronous transmission, flow control, error detection and control, HDLC protocols.
	C224.4	Analyse different networking devices in simplifying some real time networking applications.
	C224.5	Analyse different types of multiplexing techniques.
ADVANCED DATA STRUCTURES	**C225.1**	Understand various tree data structures.
	C225.2	Apply various hashing techniques.
	C225.3	Analyse external sorting algorithms and disjoint set algorithms.
	C225.4	Understand concepts related to priority queues, graph algorithms and Amortized analysis.

COURSE	C.O CODE	COURSE OUTCOME DESCRIPTION
OPERATIONS RESEARCH	C226.1	Solve LPP problems using various methods.
	C226.2	Solve Transportation, Assignment problems using several methods and travelling salesman problems, sequencing problem.
	C226.3	Discuss the PERT and CPM charts.
	C226.4	Analyse the replacement problems, Game theory problems and inventory management with real time applications.
ENVIRONMENTAL STUDIES	C227.1	Ability to acquire knowledge about the importance of environment & availability of resources.
	C227.2	Understand different environmental challenges induced due to anthropogenic activities as well as nature.
	C227.3	Able to identify the solutions to the environmental problems for the sake of healthy life by protecting our natural resources.
	C227.4	Create awareness on the social issues, environmental protection acts.
	C227.5	Able to understand the environmental impact of developmental activities.
OPERATING SYSTEMS LAB	C228.1	Demonstrate the fundamental UNIX commands and system calls.
	C228.2	Apply the scheduling algorithms for the given problem.
	C228.3	Apply the process synchronization concept using shared memory, semaphores for the given situation.
	C228.4	Experiment an algorithm to detect and avoid dead lock.
	C228.5	Apply the various methods used for memory management and page replacement algorithm.
DIGITAL ELECTRONICS & MICROPROCESSORS LAB	C229.1	Implement the logic gates, half adders, full adders and flip-flops to design a circuit.
	C229.2	Implement the 8085 assembly language programs.
	C229.3	Implement the memory chip, I/O chip and peripherals, data converters interfacing to 8085.

COURSE	C.O CODE	COURSE OUTCOME DESCRIPTION
COMPUTER NETWORKS	C311.1	Apply fundamental principles of computer networking for solving engineering problems.
	C311.2	Analyse the design principles, protocols, addressing and algorithms likerouting and congestion in the MAC (Medium Access Control Layer) network layer, transport layer, and application layer.
	C311.3	Apply the fundamental principles of wireless Networks and overview ofadvanced networking concepts in designing and solving networking problems.
	C311.4	Apply different networking devices in simplifying some real time networking applications.
WEB TECHNOLOGIES	C313.1	Design a web application using client-side scripting languages like HTML, Java script and XML.
	C313.2	Design a web application using server-side application like Servlet.
	C313.3	Understand a Server scripting language PHP to develop a dynamic and interactive web page.
	C313.4	Understand Database connectivity using MySQL.
FORMAL LANGUAGES & AUTOMATA THEORY	C314.1	Able to understand basic concepts in formal language theory, grammars, automata theory, computability theory and decidability.
	C314.2	Able to demonstrate abstract models of computing, including Finite Automata, Push Down Automata (PDA) and Turing (TM) machine models andtheir power to recognize the languages.
	C314.3	Able to explain and manipulate the different concepts in automata theory andformal languages such as, (non-)deterministic automata, regular expressions, regular languages, context-free grammars, context-free languages, Turing machines.
	C314.4	Able to understand the relationship among classes of languages and grammars.

COURSE	C.O CODE	COURSE OUTCOME DESCRIPTION
DATABASE MANAGEMENT SYSTEMS	**C315.1**	The ability to apply the concepts of engineering i.e collecting data, organize the data in the systematic form, arrange the data in a computational way andthis the way in applying mathematics.
	C315.2	Able to design the ER diagrams as well as interpret the design of database.
	C315.3	Demonstrate an understanding of the relational data model.
	C315.4	Formulate using relational algebra and SQL, solutions to a broad range of query and data update problems.
	C315.5	Demonstrate an understand of normalization theory and apply such knowledge to the normalization of a database.
	C315.6	To understand concurrency control, transition management and recovery data from system.
APPLICATION DEVELOPMENT USING JAVA	**C316.1**	Apply the basic object-oriented features in java.
	C316.2	Apply basic graphics available in applets.
	C316.3	Apply basic file IO functions like reading, writing of files, simple fie reading and writing utilities in NIO package.
	C316.4	Write simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles.
	C316.5	Apply basic multithreaded programming and network programming in java.
DATABASE MANAGEMENT SYSTEMS LAB	**C318.1**	Able to create database with different types of integrity constraints and use the SQL commands.
	C318.2	Able to use database security and authorization in order to access database for the different kinds of the user.
	C318.3	Develop an Entity-Relationship Model with the appropriate entireties, attributes, relationships, connectivity and cardinality to represent 1-1,1-Mand M-N relationships.
	C318.4	Able to access and manipulate data using PL/SQL blocks.
	C318.5	Able to connect database to front end using JDBC and ODBC driver.

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DATA COMMUNICATIONS AND COMPUTER NETWORKS LAB	**C319.1**	Able to understand the design and estimate the requirements for practical setup of a given network scenario and size.
	C319.2	Realize the Operation, maintenance and management of the Internet bymapping the theoretical networking concepts to the real-time network scenarios.
	C319.3	Demonstrate the applications of wireless Networks and overview of advanced networking concepts.
	C319.4	Identify different networking devices and their usage and functionality.
DATA WAREHOUSING AND DATA MINING	**C321.1**	Understand the basic concepts of data mining and data warehouse.
	C321.2	Understand various data pre-processing techniques to build data warehouse.
	C321.3	Understand the differences between OLTP and OLAP and data cube Computation Techniques.
	C321.4	Understand Mining Frequent Patterns, Classification & Prediction in data mining.
	C321.5	Understand Cluster Analysis in data mining.
OBJECT ORIENTED SOFTWARE ENGINEERING	**C322.1**	Will be able to apply software engineering theory, principles. tools and processes, as well as the theory and principles of computer science and mathematics, to the development and maintenance of complex, scalable software systems.
	C322.2	Will be able to design models using Unified Modelling Language and experiment with software prototypes.
	C322.3	Will be able to elicit, analyse and specify software requirements through a productive working relationship with project stakeholders and test whetherall the requirements specified have been achieved or not.
	C322.4	Ability To know about project management.
DESIGN AND ANALYSIS OF ALGORITHMS	**C324.1**	Understand fundamentals and efficiency of algorithms and brute-force technique.
	C324.2	Apply various algorithm design techniques such as Divide and Conquer, Decrease and Conquer and Transform and Conquer.
	C324.3	Apply various algorithm design techniques such as Space and Time Trade-offs Dynamic Programming.
	C324.4	Analyse algorithms for problems using various algorithmic methods such asgreedy method, space and time trade-offs and Branch and bound, backtracking, NP hard problems.

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COMPUTER GRAPHICS	**C325.1**	Understand computer graphics with a foundation in Graphics Applications and graphics display technologies.
	C325.2	Analyse the basic output primitive algorithms along with their attribute concepts to display the objects.
	C325.3	Apply 2D transformation and apply clipping operation concepts to model an object.
	C325.4	Apply the 3D Transformations, projection transformations and know 3D object representations with colour models.
COMPILER DESIGN	**C326.1**	Knowledge Have a clear understanding of phases of compilers.
	C326.2	Cognitive skills (thinking and analysis) Acquire a full understanding about the major concept and areas of languagetranslation in compilers. Be able to design the functionality and complexity levels of varioustranslators, linkers, loaders. Be able to Compare and differentiate various parsing and grammar transformation techniques.
	C326.3	Professional Skill Perceive the Construction of intermediate code and performs type checking.
	C326.4	Attitude & Tools Illustrate Code generation obtains machine independent code optimizationand instruction scheduling and Schedule symbol table and run time environment. Apply the knowledge of lex tool & YAAC tool to develop a scanner & parser and use the new tools and technologies used for designing a compiler.
CRYPTOGRAPHY AND NETWORK SECURITY	**C327.1**	Analyse the basic security concepts and cryptographic tools.
	C327.2	Identify the different security threats and implement security model to prevent, detect and recover from attacks.
	C327.3	Understand the different software security issues.
	C327.4	Apply the various Cryptographic Techniques to encrypt and decrypt the data.
	C327.5	Implement the various Network Security Protocols and Standards.
SOFTWARE ENGINEERING MINI PROJECT LAB	**C328.1**	Model software projects into high level design using UML diagrams.
	C328.2	Apply the project management principles in developing the projects.

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WEB TECHNOLOGIES LAB	**C329.1**	Demonstrate the use of various HTML tags, technologies and frameworks.
	C329.2	Develop web page using HTML web applications.
	C329.3	Illustrate the working of modem and email system development.
	C329.4	Design a website using HTML and CSS.
EMBEDDED SYSTEMS	**C411.1**	Able to understand the Basics of Embedded Systems.
	C411.2	Able to understand the Basics of 8051 Microcontroller.
	C411.3	Ability to understand the concepts related to RTOS, Inter Task Communication methods and design issues.
	C411.4	Ability to understand about Embedded Software Development Tools and Debugging Techniques.
	C411.5	Able to understand the Basics of Internet of Things.
CYBER SECURITY & DIGITAL FORENSICS	**C412.1**	Understand the fundamentals of information security, cyber security and cyber law.
	C412.2	Understand the perspective of penetration testing and how to address the most common vulnerabilities.
	C412.3	Understand the fundamental risk management principles as it relates to cyber security.
	C412.4	Understand various forensics technologies, preservation of digital evidence and cyber incident analysis & response.

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ARTIFICIAL INTELLIGENCE	**C413.1**	Understand the different artificial intelligence techniques.
	C413.2	Analyse the various Artificial intelligence search algorithms.
	C413.3	Apply the knowledge representation, reasoning techniques to solve the problems.
	C413.4	Understand the natural language processing, planning and Expert systems.
PRINCIPLES OF ECONOMICS AND MANAGEMENT	**C414.1**	Understand the concept of economics, principles and functions of management.
	C414.2	Have knowledge on forms of business organizations and conditions of different market structure.
	C414.3	Have clear picture on the functional areas of the management.
	C414.4	Understand the role on entrepreneurs and entrepreneurship in the present business world.
BIGDATA ANALYTICS	**C416.1**	Solve big data problems using Apache Hadoop Eco system.
	C416.2	Compare the distributed, parallel, cloud computing and SQL concepts.
	C416.3	Analyse various Hadoop concepts.
	C416.4	Criticize appropriate Hadoop concepts in map, reduce and functional programming.
KNOWLEDGE ENGINEERING LAB	**C417.1**	Implement the data analytics operations on datasets to perform with R programming.
	C417.2	Apply the various data mining techniques to exact patterns from different types of datasets using WEKA.
	C417.3	Apply knowledge represented in the form of rules to draw conclusions using forward chaining, backward chaining, Clips/Prolog.
BIGDATA ANALYTICS LAB	**C418.1**	Understand the fundamentals of Hadoop.
	C418.2	Capable to quickly adapt to new technology in the field of Big Data, assimilate new information, and solve real world problems.
	C418.3	Apply tools and techniques to analyse big data.
INTERNET OF THINGS LAB	**C419.1**	Able to examine the protypes for IOT.
	C419.2	Able to implement connectivity in IOT systems.
	C419.3	Able to design an IOT system comprising sensors, wireless network connection, Data analytics.

COURSE	C.O CODE	COURSE OUTCOME DESCRIPTION
PROJECT WORK	**C421.1**	Identify the complex engineering problems relevant to the society and industry.
	C421.2	Apply modern technologies, tools and systems in the field of information technology to analyse theidentified problem.
	C421.3	Design and implement a viable solution to the problem.
	C421.4	Apply communication, report writing skills& Presentation skills.
	C421.5	Develop the teamwork and leadership skills with professional and ethical values.