Course Outcomes for 18 Scheme Courses

C PROGRAMMING FOR PROBLEM SOLVING	Sub Code:18CPS13/23
C113.1	Understand the fundamental knowledge of C programming and problem solving skills.
C113.2	Apply the branching and looping concepts in C programming.
C113.3	Implement the concepts of modularization using arrays and strings
C113.4	Implement the structures, pointers and file management operations.
C113.5	Implement an application by applying the concepts of C programming language.

DATA STRUCTURES AND APPLICATIONS	Sub Code:18CS32
C233.1	Use different types of data structures, operations and algorithms
C233.2	Apply searching and sorting operations on files
C233.3	Use stack, Queue, Lists, Trees and Graphs in problem solving
C233.4	Implement all data structures in a high-level language for problem solving.

ANALOG AND DIGITAL CIRCUITS	Sub Code:18CS33
C232.1	Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.
C232.2	Explain the basic principles of A/D and D/A conversion circuits and develop the same.
C232.3	Simplify digital circuits using Karnaugh Map , and Quine-McClusky Methods
C232.4	Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types.
C232.5	Develop simple HDL programs

COMPUTER ORGANIZATION	Sub Code:18CS34
C234.1	Explain the basic organization of a computer system.
C234.2	Demonstrate functioning of different sub systems, such as processor, Input/output,and memory.
C234.3	Illustrate hardwired control and micro programmed control, pipelining, embedded and other computing systems.
C234.4	Design and analyse simple arithmetic and logical units.

SOFTWARE ENGINEERING	Sub Code:18CS35
C235.1	Design a software system, component, or process to meet desired needs within realistic constraints.
C235.2	Assess professional and ethical responsibility
C235.3	Function on multi-disciplinary teams
C235.4	Use the techniques, skills, and modern engineering tools necessary for engineering practice

DISCRETE MATHEMATICAL STRUCTURES	Sub Code:18CS36
C236.1	Use propositional and predicate logic in knowledge representation and truth verification.
C236.2	Demonstrate the application of discrete structures in different fields of computer science.
C236.3	Solve problems using recurrence relations and generating functions.
C236.4	Application of different mathematical proofs techniques in proving theorems in the courses.
C236.5	Compare graphs, trees and their applications.

ANALOG AND DIGITAL ELECTRONICS LAB	Sub Code:18CSL37
C237.1	Use appropriate design equations / methods to design the given circuit.
C237.2	Examine and verify the design of both analog and digital circuits using simulators.
C237.3	Make us of electronic components, ICs, instruments and tools for design and testing of circuits for the given the appropriate inputs.
C237.4	Compile a laboratory journal which includes; aim, tool/instruments/software/components used, design equations used and designs, schematics, program listing, procedure followed, relevant theory, results as graphs and tables, interpreting and concluding the findings.

DATASTRUCTURES LABORATORY	Sub Code:18CSL38
C238.1	Analyze and Compare various linear and non-linear data structures
C238.2	Code, debug and demonstrate the working nature of different types of data structures and their applications
C238.3	Implement, analyze and evaluate the searching and sorting algorithms
C238.4	Choose the appropriate data structure for solving real world problems

COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS	Sub Code:18MAT41
C241.1	Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
C241.2	Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
C241.3	Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
C241.4	Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
C241.5	Construct joint probability distributions and demonstrate the validity of testing the hypothesis.

Design and Analysis of Algorithms   Sub Code:18CS42

C242.1	**Describe computational solution to well-known problems like searching, sorting etc**
C242.2	**Estimate the computational complexity of different algorithms.**
C242.3	**Devise an algorithm using appropriate design strategies for problem solving.**

OPERATING SYSTEMS   Sub Code:18CS43

C243.1	Demonstrate need for OS and different types of OS
C243.2	Apply suitable techniques for management of different resources
C243.3	Use processor, memory, storage and file system commands
C243.4	Realize the different concepts of OS in platform of usage through case studies

MICROCONTROLLER AND EMBEDDED SYSTEMS   Sub Code:18CS44

C244.1	Describe the architectural features and instructions of ARM microcontroller
C244.2	Apply the knowledge gained for Programming ARM for different applications.
C244.3	Interface external devices and I/O with ARM microcontroller.
C244.4	Interpret the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
C244.5	Develop the hardware /software co-design and firmware design approaches.
C244.6	Demonstrate the need of real time operating system for embedded system applications

OBJECT ORIENTED CONCEPTS   Sub Code:18CS45

C245.1	Explain the object-oriented concepts and JAVA.
C245.2	Develop computer programs to solve real world problems in Java.
C245.3	Develop simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles using swings.

DATA COMMUNICATION   Sub Code:18CS46

C246.1	Explain the various components of data communication.
C246.2	Explain the fundamentals of digital communication and switching.
C246.3	Compare and contrast data link layer protocols.
C246.4	Summarize IEEE 802.xx standards

DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY   Sub Code:18CSL47

C247.1	Design algorithms using appropriate design techniques (brute-force, greedy, dynamic programming, etc.)
C247.2	Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language.
C247.3	Analyze and compare the performance of algorithms using language features.
C247.4	Apply and implement learned algorithm design techniques and data structuresto solve real-world problems.

MICROCONTROLLER AND EMBEDDED SYSTEMS LABORATORY   Sub Code:18CSL48

C248.1	Develop and test program using ARM7TDMI/LPC2148
C248.2	Conduct the following experiments on an ARM7TDMI/LPC2148 evaluation board using evaluation version of Embedded 'C' & Keil Uvision-4 tool/compiler.
C248.3	Understand the hardware devices and interface of ARM microcintroller and exectuion of UART, DC motor, Stepper motor, ADC, DAC using keil.
C248.4	Execution of hardware programs of LED, LCD, 7-Segment Display using kiel.

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Management and Entrepreneurship for IT industry		Sub Code : 18CS51
C351.1	Understand the basic concepts of management, planning, Organizing and Staffing.	
C351.2	Summarize the appropriate leadership styles, motivation theories, communications, Coordination and controlling, methods	
C351.3	Interpret the meaning of entrepreneur, entrepreneurship and role in economic development on India. Along with Identification of business opportunities and feasibility study	
C351.4	Inferring the new ideas, Prepare project report based on guidelines of planning commission by utilizing the resources available effectively through ERP	
C351.5	Understand the IPRs and institutional support in Micro and Small Enterprises as per the Indian Industrial Policy 2007.	

Computer Networks and Security		Sub Code: 18CS52
C352.1	Explain principles of application layer protocols	
C352.2	Recognize transport layer services and infer UDP and TCP protocols	
C352.3	Classify routers, IP and Routing Algorithms in network layer	
C352.4	Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard	
C352.5	Describe Multimedia Networking and Network Management	

Database Management System		Sub Code: 18CS53
C353.1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.	
C353.2	Use Structured Query Language (SQL) for database manipulation.	
C353.3	Design and build simple database systems	
C353.4	Develop application to interact with databases.	

Automata theory and Computability		Sub Code: 18CS54
C354.1	Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation	
C354.2	Learn how to translate between different models of Computation (e.g., Deterministic an Non-deterministic and Software models).	
C354.3	Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.	
C354.4	Develop skills in formal reasoning and reduction of a problem to a formal model, with an emphasis on semantic precision and conciseness.	
C354.5	Classify a problem with respect to different models of Computation.	

Application Development using Python	**Sub Code: 18CS55**
C355.1	Demonstrate proficiency in handling of loops and creation of functions.
C355.2	Identify the methods to create and manipulate lists, tuples and dictionaries.
C355.3	Discover the commonly used operations involving regular expressions and file system.
C355.4	Interpret the concepts of Object-Oriented Programming as used in Python.
C355.5	Determine the need for scraping websites and working with CSV, JSON and other file formats.

Unix Programming	**Sub Code: 18CS56**
C356.1	Explain Unix Architecture, File system and use of Basic Commands
C356.2	Illustrate Shell Programming and to write Shell Scripts
C356.3	Categorize, compare and make use of Unix System Calls
C356.4	Build an application/service over a Unix system.

Computer Network Laboratory	**Sub Code: 18CSL57**
C357.1	Analyze and Compare various networking protocols.
C357.2	Demonstrate the working of different concepts of networking.
C357.3	implement, analyze and evaluate networking protocols in NS2 / NS3 and JAVA programming language

DBMS Laboratory with mini project	**Sub Code: 18CSL58**
C358.1	Create, Update and query on the database.
C358.2	Demonstrate the working of different concepts of DBMS
C358.3	Implement, analyze and evaluate the project developed for an application.

File Structures   Sub Code: 18IS61

C361.1	Students are able to understand the modern software testing processes in relation to software development and project management.
C361.2	Students are able to analyze the manual test cases for software module with examples.
C361.3	Students are able to classify the problem into suitable testing model
C361.4	Students are able to analyze and use Integration and Component-Based Software Testing
C361.5	Construct the test cases for checking GUI objects by implementing mini project, group discussions, seminars, poster presentations etc..

Software Testing   Sub Code: 18IS62

C362.1	Derive test cases for any given problem
C362.2	Compare the different testing techniques
C362.3	Classify the problem into suitable testing model
C362.4	Apply the appropriate technique for the design of flow graph.
C362.5	Create appropriate document for the software artefact.

Web Technology and its applications,   Sub Code: 18CS63

C363.1	Adapt HTML and CSS syntax and semantics to build web pages.
C363.2	Construct and visually format tables and forms using HTML and CSS
C363.3	Develop Client-Side Scripts using JavaScript and Server-Side Scripts using PHP to generate and display the contents dynamically.
C363.4	Appraise the principles of object oriented development using PHP
C363.5	Inspect JavaScript frameworks like jQuery and Backbone which facilitates developer to focus on core feature.

Data Mining and Data Warehousing   Sub Code: 18CS641

C364.1	Identify data mining problems and implement the data warehouse
C364.2	Write association rules for a given data pattern.
C364.3	Choose between classification and clustering solution.

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Software Testing Laboratory	**Sub Code: 18ISL66**
C366.1	List out the requirements for the given problem
C366.2	Design and implement the solution for given problem in any programming language(C,C++,JAVA)
C366.3	Derive test cases for any given problem
C366.4	Apply the appropriate technique for the design of flow graph.
C366.5	Create appropriate document for the software artefact.

File Structure Laboratory	**Sub Code: 18ISL67**
C367.1	Implement operations related to files
C367.2	Apply the concepts of file system to produce the given application.
C367.3	Evaluate performance of various file systems on given parameters.

Mobile Application Development	**Sub Code:18CSMP68**
C368.1	Create, test and debug Android application by setting up Android development environment.
C368.2	Implement adaptive, responsive user interfaces that work across a wide range of devices.
C368.3	Infer long running tasks and background work in Android applications.
C368.4	Demonstrate methods in storing, sharing and retrieving data in Android applications.
C368.5	Infer the role of permissions and security for Android applications.

Artificial Intelligence and Machine Learning	**Sub Code: 18CS71**
C471.1	Appaise the theory of Artificial intelligence and Machine Learning.
C471.2	Illustrate the working of AI and ML Algorithms.
C471.3	Demonstrate the applications of AI and ML

Big Data Analytics   Sub Code: 18CS72

C472.1	Understand fundamentals of Big Data analytics.
C472.2	Investigate Hadoop framework and Hadoop Distributed File system.
C472.3	Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
C472.4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
C472.5	Use Machine Learning algorithms for real world big data.
C472.6	Analyze web contents and Social Networks to provide analytics with relevant visualization tools.

User Interface Design   Sub Code: 18CS734

C473.1	Understand the importance of user interface and benefits of good design.
C473.2	Understand the user interface design process and business function
C473.3	Understand the types of system menus and navigation schemes.
C473.4	Understand the characteristics of windows and device based controls.
C473.5	Understand the screen based controls and kinds of tests.

Network Management   Sub Code: 18CS742

C4742.1	Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.
C4742.2	Apply network management standards to manage practical networks
C4742.3	Formulate possible approaches for managing OSI network model.
C4742.4	Use on SNMP for managing the network
C4742.5	Use RMON for monitoring the behavior of the network
C4742.6	Identify the various components of network and formulate the scheme for the managing them.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY		Sub Code: 18CSL76
C476.1	Apply various algorithms and datasets	
C476.2	Analyze the performance of algorithms.	
C476.3	Develop and demonstrate AI and ML algorithms.	
C476.4	Use modern tools to implement AI & ML algorithms	

Project Work Phase-I   Sub Code:18CSP77

C477.1	Able to apply the fundamentals of information science and engineering concepts
C477.2	Able to review research literature to find solutions to the problems by using research based knowledge
C477.3	Able to design the methodologies for solving engineering problems and follow the ethics
C477.4	Able to apply project management principles by following Software Development Life Cycle and indulge in life long learning
C477.5	Able to communicate effectively, write effective reports and can work individually as well as in team

Internet of Things and Applications   Sub Code: 18CS81

C481.1	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
C481.2	Compare and contrast the deployment of smart objects and the technologies to connect them to network.
C481.3	Appraise the role of IoT protocols for efficient network communication.
C481.4	Elaborate the need for Data Analytics and Security in IoT.
C481.5	Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

Project Work Phase - II   Sub Code: 18CSP83

C483.1	Able to find solutions to the problems by using research based knowledge
C483.2	Able to apply project management principles by following Software Development Life Cycle and indulge in life long learning
C483.3	Able to communicate effectively, write effective reports
C483.4	Able to apply modern tools in order to find the solutions
C483.5	Able to work individually as well as in team and follow ethics

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Technical Seminar	**Sub Code: 18CSS84**
C484.1	Students Explore to new technologies in the real world prior to graduation
C484.2	Identify, understand and discuss current, real-world issues
C484.3	To develop skills in presentation and discussion of seminar topic
Internship	**Sub Code: 18CSI85**
C484.1	Students Explore career alternatives prior to graduation
C484.2	Analyze and Integrate theory, practices.
C484.3	Develop work habits by using modren tools and attitudes necessary for job success.
C484.4	Develop communication, interpersonal and other critical skills in the job interview process.

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Course Outcomes for 2021 Scheme Courses		
Subject: PROBLEM-SOLVING THROUGH PROGRAMMING		**21PSP23/13**
1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.	
2	Apply programming constructs of C language to solve the real world problem	
3	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting	
4	Explore user-defined data structures like structures, unions and pointers in implementing solutions	
5	Design and Develop Solutions to problems using modular programming constructs using functions	
Subject: COMPUTER PROGRAMMING LABORATORY		**21CPL27/17**
1	Define the problem statement and identify the need for computer programming	
2	Make use of C compiler, IDE for programming, identify and correct the syntax and syntactic errors in programming	
3	Develop algorithm, flowchart and write programs to solve the given problem	
4	Demonstrate use of functions, recursive functions, arrays, strings, structures and pointers in problem solving.	
5	Document the inference and observations made from the implementation	
Subject: DATA STRUCTURES AND APPLICATIONS		**21CS32**
1	Identify different data structures and their applications.	
2	Apply stack and queues in solving problems.	
3	Demonstrate applications of linked list	
4	Explore the applications of trees and graphs to model and solve the real-world problem.	
5	Make use of Hashing techniques and resolve collisions during mapping of key value pairs	
Subject: ANALOG AND DIGITAL ELECTRONICS		**21CS33**
1	Design and analyze application of analog circuits using photo devices, timer IC, power supply and regulator IC and op-amp.	
2	Explain the basic principles of A/D and D/A conversion circuits and develop the same	
3	Simplify digital circuits using Karnaugh Map, and Quine-McClusky Methods	
4	Explain Gates and flip flops and make us in designing different data processing circuits, registers and counters and compare the types	
5	Develop simple HDL programs	

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Course Outcomes for 2021 Scheme Courses	
Subject: COMPUTER ORGANIZATION AND ARCHITECTURE	**21CS34**
1	Explain the organization and architecture of computer systems with machine instructions and programs
2	Analyze the input/output devices communicating with computer system
3	Demonstrate the functions of different types of memory devices
4	Apply different data types on simple arithmetic and logical unit
5	Analyze the functions of basic processing unit, Parallel processing and pipelining
Subject: OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY	**21CSL35**
1	Use Eclipse/NetBeans IDE to design, develop, debug Java Projects.
2	Analyze the necessity for Object Oriented Programming paradigm over structured programming and become familiar with the fundamental concepts in OOP
3	Demonstrate the ability to design and develop java programs, analyze, and interpret object-oriented data and document results
4	Apply the concepts of multiprogramming, exception/event handling, abstraction to develop robust programs
5	Develop user friendly applications using File I/O and GUI concepts
Subject: C++ PROGRAMMING	**21CS382**
1	Able to understand and design the solution to a problem using object-oriented programming concepts.
2	Able to reuse the code with extensible Class types, User-defined operators and function Overloading.
3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism
4	Identify and explore the Performance analysis of I/O Streams.
5	Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems
Subject: DESIGN AND ANALYSIS OF ALGORITHMS	**21CS42**
1	Analyze the performance of the algorithms, state the efficiency using asymptotic notations and analyze mathematically the complexity of the algorithm.
2	Apply divide and conquer approaches and decrease and conquer approaches in solving the problems analyze the same
3	Apply the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem.
4	Apply and analyze dynamic programming approaches to solve some problems. and improve an algorithm time efficiency by sacrificing space.
5	Apply and analyze backtracking, branch and bound methods and to describe P, NP and NP-Complete problems

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Course Outcomes for 2021 Scheme Courses	
Subject :MICROCONTROLLER AND EMBEDDED SYSTEMS	**21CS43**
1	Explain C-Compilers and optimization
2	Describe the ARM microcontroller's architectural features and program module.
3	Apply the knowledge gained from programming on ARM to different applications.
4	Program the basic hardware components and their application selection method.
5	Demonstrate the need for a real-time operating system for embedded system applications
Subject :OPERATING SYSTEMS	**21CS44**
1	Identify the structure of an operating system and its scheduling mechanism.
2	Demonstrate the allocation of resources for a process using scheduling algorithm.
3	Identify root causes of deadlock and provide the solution for deadlock elimination
4	Explore about the storage structures and learn about the Linux Operating system.
5	Analyze Storage Structures and Implement Customized Case study
PYTHON PROGRAMMING LABORATORY	**21CSL46**
1	Demonstrate proficiency in handling of loops and creation of functions.
2	Identify the methods to create and manipulate lists, tuples and dictionaries.
3	Discover the commonly used operations involving regular expressions and file system.
4	Interpret the concepts of Object-Oriented Programming as used in Python.
5	Determine the need for scraping websites and working with PDF, JSON and other file formats.
WEB PROGRAMMING	**21CSL481**
1	Describe the fundamentals of web and concept of HTML.
2	Use the concepts of HTML, XHTML to construct the web pages.
3	Interpret CSS for dynamic documents.
4	Evaluate different concepts of JavaScript & Construct dynamic documents.
5	Design a small project with JavaScript and XHTML

Course Outcomes for 2021 Scheme Courses	
AUTOMATA THEORY AND COMPILER DESIGN	**21CS51**
1	Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation
2	Design and develop lexical analyzers, parsers and code generators
3	Design Grammars and Automata (recognizers) for different language classes and become Knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.
4	Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers
5	Design computations models for problems in Automata theory and adaptation of such model in the field of compilers
COMPUTER NETWORKS	**21CS52**
1	Learn the basic needs of communication system.
2	Interpret the communication challenges and its solution.
3	Identify and organize the communication system network components
4	Design communication networks for user requirements.
DATABASE MANAGEMENT SYSTEMS	**21CS53**
1	Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS
2	Use Structured Query Language (SQL) for database manipulation and also demonstrate the basic of query evaluation
3	Design and build simple database systems and relate the concept of transaction, concurrency control and recovery in database
4	Develop application to interact with databases, relational algebra expression
5	Develop applications using tuple and domain relation expression from queries.
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	**21CS54**
1	Apply the knowledge of searching and reasoning techniques for different applications.
2	Have a good understanding of machine leaning in relation to other fields and fundamental issues and challenges of machine learning.
3	Apply the knowledge of classification algorithms on various dataset and compare results
4	Model the neuron and Neural Network, and to analyze ANN learning and its applications.
5	Identifying the suitable clustering algorithm for different pattern

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Course Outcomes for 2021 Scheme Courses		
DATABASE MANAGEMENT SYSTEMS LABORATORY WITH MINI PROJECT		**21CSL55**
1	Create, Update and query on the database.	
2	Demonstrate the working of different concepts of DBMS	
3	Implement, analyze and evaluate the project developed for an application	
C# AND .NET FRAMEWORK		**21CS582**
1	Able to explain how C# fits into the .NET platform.	
2	Describe the utilization of variables and constants of C#	
3	Use the implementation of object-oriented aspects in applications.	
4	Analyze and Set up Environment of .NET Core.	
5	Evaluate and create a simple project application.	
SOFTWARE ENGINEERING & PROJECT MANAGEMENT		**21CS61**
1	Understand the activities involved in software engineering and analyze the role of various process models	
2	Explain the basics of object-oriented concepts and build a suitable class model using modeling techniques	
3	Describe various software testing methods and to understand the importance of agile methodology and DevOps	
4	Illustrate the role of project planning and quality management in software development	
5	Understand the importance of activity planning and different planning models	
FULLSTACK DEVELOPMENT		**21CS62**
1	Understand the working of MVT based full stack web development with Django.	
2	Designing of Models and Forms for rapid development of web pages.	
3	Analyze the role of Template Inheritance and Generic views for developing full stack web applications.	
4	Apply the Django framework libraries to render non HTML contents like CSV and PDF.	
5	Perform jQuery based AJAX integration to Django Apps to build responsive full stack web applications	
SOFTWARE TESTING		**21IS63**
1	Explain the significance of software testing and quality assurance in software development	
2	Apply the concepts of software testing to assess the most appropriate testing method.	
3	Analyze the importance of testing in software development.	
4	Evaluate the suitable testing model to derive test cases for any given software	
5	Develop appropriate document for the software artifact	

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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Outcomes for 2021 Scheme Courses	
DATA MINING AND DATA WAREHOUSING	**21IS643**
1	Understand warehousing architectures and tools for systematically organizing large database and use their data to make strategic decisions.
2	Apply KDD process for finding interesting pattern from warehouse
3	Analyze the kinds of patterns that can be discovered by association rule mining.
4	Evaluate interesting patterns from large amounts of data to analyze for predictions and classification.
5	Design select suitable methods for data mining and analysis
PROGRAMMING IN JAVA	**21CS654**
1	Develop JAVA programs using OOP principles and proper program structuring.
2	Develop JAVA program using packages, inheritance and interface.
3	Develop JAVA programs to implement error handling techniques using exception handling
4	Demonstrate string handling concepts using JAVA
SOFTWARE TESTING LABORATORY	**21ISL66**
1	List out the requirements for the given problem and develop test cases for any given Problem.
2	Design and implement the solution for given problem and to design flow graph
3	Use Eclipse/NetBeans IDE and testing tools to design, develop, debug the Project and create appropriate document for the software artifact.
4	Use the appropriate functional testing strategies. Compare the different testing techniques.
5	Classify and Compare the problems according to a suitable testing model applying the test coverage metrics.
CRYPTOGRAPHY AND NETWORK SECURITY	**21IS71**
1	Understand Cryptography, Network Security theories, algorithms and systems
2	Apply different Cryptography and Network Security operations on different applications
3	Analyze different methods for authentication and access control
4	Evaluate Public and Private key, Key management, distribution and certification
5	Design necessary techniques to build protection mechanisms to secure computer networks

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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Outcomes for 2021 Scheme Courses	
CLOUD COMPUTING	**21CS72**
1	Understand and analyze various cloud computing platforms and service provider.
2	Illustrate various virtualization concepts.
3	Identify the architecture, infrastructure and delivery models of cloud computing.
4	Understand the Security aspects of CLOUD.
5	Define platforms for development of cloud applications
INTERNET OF THINGS	**21CS735**
1	Understand the evolution of IoT, IoT networking components, and addressing strategies in IoT.
2	Analyze various sensing devices and actuator types.
3	Demonstrate the processing in IoT.
4	Apply different connectivity technologies.
SOFTWARE ARCHITECTURE AND DESIGN PATTERNS	**21CS741**
1	Design and implement codes with higher performance and lower complexity
2	Be aware of code qualities needed to keep code flexible
3	Experience core design principles and be able to assess the quality of a design with respect to these principles.
4	Capable of applying these principles in the design of object oriented systems.
5	Demonstrate an understanding of a range of design patterns. Be capable of comprehending a design presented using this vocabulary.
6	Be able to select and apply suitable patterns in specific contexts
PROJECT	**21ISP76**
1	Able to find solutions to the problems by using research based knowledge
2	Able to apply project management principles by following Software Development Life Cycle and indulge in life long learning
3	Able to communicate effectively, write effective reports
4	Able to apply modern tools in order to find the solutions
5	Able to work individually as well as in team and follow ethics

Course Outcomes for 2021 Scheme Courses	
SEMINMAR	**21IS81**
1	Students Explore to new technologies in the real world prior to graduation
2	Identify, understand and discuss current, real-world issues
3	To develop skills in presentation and discussion of seminar topic

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Course Outcomes for 2022 Scheme Courses	
Principles of Programming using C	**BPOPS103/203**
1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.
2	Apply programming constructs of C language to solve the real world problem
3	Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting
4	Explore user-defined data structures like structures, unions and pointers in implementing solutions
5	Design and Develop Solutions to problems using modular programming constructs using functions
Introduction to Web Programming	**BPLCK105A/205A**
1	Explain the historical context and justification for HTML over XHTML
2	Develop HTML5 documents and adding various semantic markup tags
3	Analyse various attributes, values and types of CSS
4	Implement core constructs and event handling mechanisms of JavaScript.
Introduction to Python Programming	**BPLCK105B/205B**
1	Demonstrate proficiency in handling loops and creation of functions.
2	Identify the methods to create and manipulate lists, tuples and dictionaries.
3	Develop programs for string processing and file organization
4	Interpret the concepts of Object-Oriented Programming as used in Python.
Basics of Java Programming	**BPLCK105C/205C**
1	To explain the features and object oriented concepts in JAVA programming
2	To analyse working of bitwise operators in JAVA
3	To develop simple programs based on polymorphism and inheritance
4	To describe the concepts of importing packages and exception handling mechanism

Course Outcomes for 2022 Scheme Courses

Introduction to C++ Programming		BPLCK105D/205D
1	Able to understand and design the solution to a problem using object-oriented programming concepts.	
2	Able to reuse the code with extensible Class types, User-defined operators and function Overloading.	
3	Achieve code reusability and extensibility by means of Inheritance and Polymorphism	
4	Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems	

Digital Design and Computer Organization		BCS302
1	Apply the K–Map techniques to simplify various Boolean expressions.	
2	Design different types of combinational and sequential circuits along with Verilog programs.	
3	Describe the fundamentals of machine instructions, addressing modes and Processor performance.	
4	Explain the approaches involved in achieving communication between processor and I/O devices.	
5	Analyze internal Organization of Memory and Impact of cache/Pipelining on Processor Performance.	

Operating Systems		BCS303
1	Explain the structure and functionality of operating system	
2	Apply appropriate CPU scheduling algorithms for the given problem.	
3	Analyse the various techniques for process synchronization and deadlock handling.	
4	Apply the various techniques for memory management.	
5	Explain file and secondary storage management strategies.	
6	Describe the need for information protection mechanisms	

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Course Outcomes for 2022 Scheme Courses	
Data Structures And Applications	**BCS304**

1	Explain different data structures and their applications.
2	Apply Arrays, Stacks and Queue data structures to solve the given problems.
3	Use the concept of linked list in problem solving.
4	Develop solutions using trees and graphs to model the real-world problem.
5	Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal Binary Search Trees.

Data Structures Laboratory	**BCSL305**
1	Analyze various linear and non-linear data structures
2	Demonstrate the working nature of different types of data structures and their applications
3	Use appropriate searching and sorting algorithms for the give scenario.
4	Apply the appropriate data structure for solving real world problems

Object Oriented Programming with JAVA	**BCS306A**
1	Demonstrate proficiency in writing simple programs involving branching and looping structures.
2	Design a class involving data members and methods for the given scenario.
3	Apply the concepts of inheritance and interfaces in solving real world problems.
4	Use the concept of packages and exception handling in solving complex problem.
5	Apply concepts of multithreading, autoboxing and enumerations in program development.

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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Outcomes for 2022 Scheme Courses		
Social Connect & Responsibility		**BSCK307**
1	Communicate and connect to the surrounding.	
2	Create a responsible connection with the society.	
3	Involve in the community in general in which they work..	
4	Notice the needs and problems of the community and involve them in problem –solving.	
5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems.	
6	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes	
Project Management with Git		**BCS358C**
1	Use the basics commands related to git repository	
2	Create and manage the branches	
3	Apply commands related to Collaboration and Remote Repositories	
4	Use the commands related to Git Tags, Releases and advanced git operations	
5	Analyse and change the git history	
Analysis & Design of Algorithms		**BCS401**
1	Apply asymptotic notational method to analyze the performance of the algorithms in terms of time complexity.	
2	Demonstrate divide & conquer approaches and decrease & conquer approaches to solve computational problems.	
3	Make use of transform & conquer and dynamic programming design approaches to solve the given real world or complex computational problems.	
4	Apply greedy and input enhancement methods to solve graph & string based computational problems.	
5	Analyse various classes (P,NP and NP Complete) of problems Illustrate backtracking, branch & bound and approximation methods.	

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Course Outcomes for 2022 Scheme Courses	
Advanced Java	**BCS402**
1	Apply appropriate collection class/interface to solve the given problem
2	Demonstrate the concepts of String operations in Java
3	Apply the concepts of Swings to build Java applications
4	Develop web based applications using Java servlets and JSP
5	Use JDBC to build database applications
Database Management Systems	**BCS403**
1	Describe the basic elements of a relational database management system
2	Design entity relationship for the given scenario.
3	Apply various Structured Query Language (SQL) statements for database manipulation.
4	Analyse various normalization forms for the given application.
5	Develop database applications for the given real world problem.
6	Understand the concepts related to NoSQL databases.
Analysis & Design of Algorithms Lab	**BCSL404**
1	Develop programs to solve computational problems using suitable algorithm design strategy.
2	Compare algorithm design strategies by developing equivalent programs and observing running times for analysis (Empirical).
3	Make use of suitable integrated development tools to develop programs
4	Choose appropriate algorithm design techniques to develop solution to the computational and complex problems.
5	Demonstrate and present the development of program, its execution and running time(s) and record the results/inferences.

Course Outcomes for 2022 Scheme Courses	
Discrete Mathematical Structures	**BIS405A**

1	Apply concepts of logical reasoning and mathematical proof techniques in proving theorems and statements.
2	Demonstrate the application of discrete structures in different fields of computer science.
3	Apply the basic concepts of relations, functions and partially ordered sets for computer representations.
4	Solve problems involving recurrence relations and generating functions.
5	Illustrate the fundamental principles of Algebraic structures with the problems related to computer science & engineering.

Green IT and Sustainability	**BCS456A**
1	Classify the challenges for Green ICT
2	Relate the environmental impact due to emerging technologies.
3	Demonstrate different aspects of ICT metrics.
4	Compare the various parameters related to Sustainable Cloud Computing.
5	Interpret the effects of software design on the sustainability.

Universal human values course	**BUHK408**
1	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
2	They would have better critical ability.
3	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
4	It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

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DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

Course Outcomes for 2022 Scheme Courses	

Software Engineering & Project Management		BCS501
1	Differentiate process models to judge which process model has to be adopted for the given scenarios.	
2	Derive both functional and non-functional requirements from the case study.	
3	Analyze the importance of various software testing methods and agile methodology.	
4	Illustrate the role of project planning and quality management in software development.	
5	Identify appropriate techniques to enhance software quality.	

Computer networks		BCS502
1	Explain the fundamentals of computer networks.	
2	**Apply** the concepts of computer networks to demonstrate the working of various layers andprotocols in communication network	
3	**Analyze** the principles of protocol layering in modern communication systems.	
4	Demonstrate various Routing protocols and their services using tools such as Cisco packet tracer.	

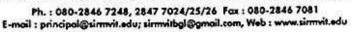| Theory Of Computation		BCS503
1	Apply the fundamentals of automata theory to write DFA, NFA, Epsilon-NFA and conversion between them.	
2	Prove the properties of regular languages using regular expressions.	
3	Design context-free grammars (CFGs) and pushdown automata (PDAs) for formal languages..	
4	Design Turing machines to solve the computational problems	
5	Explain the concepts of decidability and undecidability.	

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Course Outcomes for 2022 Scheme Courses	
Data Visualization Lab	**BAIL504**
1	Design the experiment to create basic charts and graphs using Tableau and Power BI.
2	Develop the solution for the given real world problem.
3	Analyze the results and produce substantial written documentation.
Unix System Programming	**BCS515C**
1	Demonstrate the basics of Unix concepts and commands.
2	Demonstrate the UNIX file system.
3	Apply commands to reflect changes in file system.
4	Demonstrate IPC and process management.
5	Develop an application/service over a Unix system.
Research Methodology & IPR	**BRMK557**
1	To know the meaning of engineering research.
2	To know the procedure of the literature Review and Technical Reading
3	To understand the fundamentals of the patent laws and drafting procedure
4	Understanding the copyright laws and subject matters of copyrights and designs
5	Understanding the basic principles of design rights

Course Outcome for Subject Name: **Mathematics-I for Computer Science and Engineering stream**
Subject Code: 22BMATS101

Course objectives: The goal of the course Mathematics-I for Computer Science and Engineering stream(22MATS11) is to
- Familiarize the importance of calculus associated with one variable and multivariable for computer science and engineering.
- Analyse Computer science and engineering problems by applying Ordinary Differential
- Equations.
- Apply the knowledge of modular arithmetic to computer algorithms.
- Develop the knowledge of Linear Algebra to solve the system of equations

Course outcome (Course Skill Set)
At the end of the course the student will be able to:

	Course Outcome - Mathematics-I for Computer Science and Engineering stream (22BMATS101)
CO1	apply the knowledge of calculus to solve problems related to polar curves andlearn the notion of partial differentiation to compute rate of change of multivariate functions
CO2	analyze the solution of linear and nonlinear ordinary differential equations
CO3	get acquainted and to apply modular arithmetic to computer algorithms
CO4	make use of matrix theory for solving the system of linear equations and compute eigenvalues and eigenvectors
CO5	familiarize with modern mathematical tools namely MATHEMATICA/MATLAB/ PYTHON/ SCILAB

Course Outcome for Subject Name: **Applied Physics for CSE Stream**
Subject Code: **BPHYS102/202**

Course objectives
- To study the essentials of photonics and its application in computer science.
- To study the principles of quantum mechanics and its application in quantum computing.
- To study the electrical properties of materials
- To study the essentials of physics for computational aspects like design and data analysis.

	Course Outcome - Applied Physics for CSE Stream (BPHYS102/202)
CO1	Describe the principles of LASERS and Optical fibers and their relevant applications.
CO2	Discuss the basic principles of the Quantum Mechanics and its application in Quantum Computing.
CO3	Summarize the essential properties of superconductors and its applications in qubits.
CO4	Illustrate the application of physics in design and data analysis.
CO5	Practice working in groups to conduct experiments in physics and perform precise and honest measurements

SUBJECT NAME: Principles of Programming using C
Subject Code: BPOPS103/203

Course Objectives:
CLO 1. Elucidate the basic architecture and functionalities of a computer
CLO 2. Apply programming constructs of C language to solve the real-world problems
CLO 3. Explore user-defined data structures like arrays, structures and pointers in implementing solutions to problems
CLO 4. Design and Develop Solutions to problems using structured programming constructs such as functions and procedures

Course Outcome - Principles of Programming using C (BPOPS103/203)	
CO1	Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts
CO2	Apply programming constructs of C language to solve the real world problem
CO3	Describe the fundamentals of machine instructions, addressing modes and Processor performance. Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting
CO4	Explore user-defined data structures like structures, unions and pointers in implementing solutions
CO5	Design and Develop Solutions to problems using modular programming constructs using functions

SUBJECT NAME: Mathematics-II for Computer Science and Engineering stream
Subject Code: 22BMATS201

Course objectives: The goal of the course Mathematics-II for Computer Science and Engineering stream(22MATS21) is to
- Familiarize the importance of Integral calculus and Vector calculus.
- Learn vector spaces and linear transformations.
- Develop the knowledge of numerical methods and apply them to solve transcendental and differential equations.

Course Outcome - Mathematics-II for Computer Science and Engineering stream (22BMATS201)	
CO1	Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing area and volume
CO2	Understand the applications of vector calculus refer to solenoidal, and irrotational vectors. Orthogonal curvilinear coordinates.
CO3	Demonstrate the idea of Linear dependence and independence of sets in the vector space, and linear transformation
CO4	Apply the knowledge of numerical methods in analysing the discrete data and solving the physical and engineering problems.
CO5	Get familiarize with modern mathematical tools namely MATHEMATICA/ MATLAB /PYTHON/ SCILAB

SUBJECT NAME: Applied Chemistry for Computer Science &Engineering stream

Subject Code: BCHES102/202

Course objectives:

• Toenablestudentstoacquireknowledgeonprinciplesofchemistryforengineeringapplications.

• Todevelopanintuitiveunderstandingofchemistrybyemphasizingtherelatedbranches of engineering.

• To provide students with a solid foundation in analytical reasoning required to solve societal problems.

	Course Outcome - Applied Chemistry for Computer Science &Engineering stream (BCHES102/202)
CO1	Identify the terms and applications processes involved in scientific and engineering
CO2	Explainthephenomenaofchemistrytodescribethemethodsofengineeringprocesses
CO3	Solvetheproblemsinchemistrythatarepertinentinengineeringapplications
CO4	Applythebasicconceptsofchemistrytoexplainthechemicalpropertiesandprocesses
CO5	Analyze properties and multidisciplinary situations processes associated with chemical substances

SUBJECT NAME: INNOVATION and DESIGN THINKING

Subject Code: BIDTK158/258

Course objectives:

- To explain the concept of design thinking for product and service development
- To explain the fundamental concept of innovation and design thinking
- To discuss the methods of implementing design thinking in the real world.

	Course Outcome - INNOVATION and DESIGN THINKING (BIDTK158/258BCS302)
CO1	Appreciate various design process procedure
CO2	Generate and develop design ideas through different technique
CO3	Identify the significance of reverse Engineering to Understand products
CO4	Draw technical drawing for design ideas

SUBJECT NAME: Digital Design and Computer Organization

Subject Code: BCS302

	Course Outcome - Digital Design and Computer Organization (BCS302)
CO1	Apply the K–Map techniques to simplify various Boolean expressions
CO2	Design different types of combinational and sequential circuits along with Verilog programs
CO3	Describe the fundamentals of machine instructions, addressing modes and Processor performance.
CO4	Explain the approaches involved in achieving communication between processor and I/O devices.
CO5	Analyze internal Organization of Memory and Impact of cache/Pipelining on Processor Performance

SUBJECT NAME: OPERATING SYSTEMS
Subject Code: BCS303

Course Outcome - OPERATING SYSTEMS (BCS303)	
CO1	. Explain the structure and functionality of operating system
CO 2	Apply appropriate CPU scheduling algorithms for the given problem.
CO 3	Analyze the various techniques for process synchronization and deadlock handling.
CO 4	Apply the various techniques for memory management
CO 5	Explain file and secondary storage management strategies.
CO6	Describe the need for information protection mechanisms

SUBJECT NAME: Mathematics for Computer Science
SUBJECT CODE: BCS301

Course Learning Objectives:

- To introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in Computer Science Engineering and social life situations.
- To Provide the principles of statistical inferences and the basics of hypothesis testing with emphasis on some commonly encountered hypotheses.
- To Determine whether an input has a statistically significant effect on the system's response through ANOVA testing.

Course Outcome: Students will be able to

CO1	Explain the basic concepts of probability, random variables, probability distribution
CO2	Apply suitable probability distribution models for the given scenario.
CO3	Apply the notion of a discrete-time Markov chain and n-step transition probabilities to solve the given problem
CO4	Use statistical methodology and tools in the engineering problem-solving process.
CO5	Compute the confidence intervals for the mean of the population.
CO6	Apply the ANOVA test related to engineering problems.

SUBJECT NAME: DATA STRUCTURES AND APPLICATIONS
SUBJECT CODE: BCS304

Course Learning Objectives:

This course (BCS304) will enable students to:
CLO 1. To explain fundamentals of data structures and their applications.
CLO 2. To illustrate representation of Different data structures such as Stack, Queues, Linked
Lists, Trees and Graphs.
CLO 3. To Design and Develop Solutions to problems using Linear Data Structures
CLO 4. To discuss applications of Nonlinear Data Structures in problem solving.
CLO 5. To introduce advanced Data structure concepts such as Hashing and Optimal Binary

Search Trees **Course Outcome: Students will be able to**

CO1	Explain different data structures and their applications.
CO2	Apply Arrays, Stacks and Queue data structures to solve the given problems.
CO3	Use the concept of linked list in problem solving.
CO4	Develop solutions using trees and graphs to model the real-world problem.
CO5	Explain the advanced Data Structures concepts such as Hashing Techniques and Optimal

SUBJECT NAME: DATA STRUCTURES LABORATORY
SUBJECT CODE: BCSL305

Course Learning Objectives:

This course (BCSL305) will enable students to:
- Dynamic memory management
- Linear data structures and their applications such as stacks, queues and lists
- Non-Linear data structures and their applications such as trees and graphs.

Course Outcome: Students will be able to

CO1	Analyze various linear and non-linear data structures
CO2	Demonstrate the working nature of different types of data structures and their applications
CO3	Use appropriate searching and sorting algorithms for the give scenario.
CO4	Apply the appropriate data structure for solving real world problems

SUBJECT NAME: Object Oriented Programming with JAVA
SUBJECT CODE: BCS306A

Course Learning Objectives:

This course (BCS306A) will enable students to:

●To learn primitive constructs JAVA programming language.

● To understand Object Oriented Programming Features of JAVA.

● To gain knowledge on: packages, multithreaded programing and exceptions.

Course Outcome: Students will be able to

CO1	Demonstrate proficiency in writing simple programs involving branching and looping structures.
CO2	2. Design a class involving data members and methods for the given scenario.
CO3	3. Apply the concepts of inheritance and interfaces in solving real world problems.
CO4	4. Use the concept of packages and exception handling in solving complex problem
CO5	5. Apply concepts of multithreading, autoboxing and enumerations in program development

SUBJECT NAME: OBJECT ORIENTED PROGRAMMING with C++
SUBJECT CODE: BCS306B
Course Learning Objectives:
This course (BCS306B) will enable students to:
● To understand object-oriented programming using C++and Gain knowledge about the capability to store information together in an object.
● To illustrate the capability of a class to rely upon another class and functions.
● To Create and process data in files using file I/O functions
● To understand the generic programming features of C++ including Exception handling
Course Outcome: Students will be able to

CO1	1 Illustrate the basic concepts of object-oriented programming.
CO2	2 Design appropriate classes for the given real-world scenario.
CO3	3 Apply the knowledge of compile-time / run-time polymorphism to solve the given problem
CO4	4 Use the knowledge of inheritance for developing optimized solutions
CO5	5 Apply the concepts of templates and exception handling for the given problem
CO6	6 Use the concepts of input output streams for file operations

SUBJECT NAME: Project Management with Git
SUBJECT CODE: BCS358C

Course Learning Objectives:

This course (BCS358C) will enable students to:

● To familiar with basic command of Git

● To create and manage branches

● To understand how to collaborate and work with Remote Repositories

● To familiar with virion controlling commands

Course Outcome: Students will be able to

CO1	Use the basics commands related to git repository
CO2	Create and manage the branches
CO3	Apply commands related to Collaboration and Remote Repositories
CO4	Use the commands related to Git Tags, Releases and advanced git operations
CO5	Analyze and change the git history

SUBJECT NAME: Analysis & Design of Algorithms
SUBJECT CODE: BCS401
Course objectives:
● To learn the methods for analysing algorithms and evaluating their performance.
● To demonstrate the efficiency of algorithms using asymptotic notations.
● To solve problems using various algorithm design methods, including brute force, greedy, divide and conquer, decrease and conquer, transform and conquer, dynamic programming, backtracking, and branch and bound.
● To learn the concepts of P and NP complexity classes.
Course outcome (Course Skill Set)

CO1	Apply asymptotic notational method to analyze the performance of the algorithms in terms of time complexity
CO2	Demonstrate divide & conquer approaches and decrease & conquer approaches to solve computational problems
CO3	Make use of transform & conquer and dynamic programming design approaches to solve the given real world or complex computational problems.
CO4	Apply greedy and input enhancement methods to solve graph & string based computational problems.
CO5	Analyze various classes (P,NP and NP Complete) of problems
CO6	Illustrate backtracking, branch & bound and approximation methods.

SUBJECT NAME: MICROCONTROLLERS
SUBJECT CODE: BCS402

Course Objectives:
CLO 1: Understand the fundamentals of ARM-based systems and basic architecture of CISC and RISC.
CLO 2: Familiarize with ARM programming modules along with registers, CPSR and Flags.
CLO 3: Develop ALP using various instructions to program the ARM controller.
CLO 4: Understand the Exceptions and Interrupt handling mechanism in Microcontrollers.
CLO 5: Discuss the ARM Firmware packages and Cache memory polices.

Course outcomes (Course Skill Set):
At the end of the course, the student will be able to:

CO1	Explain the ARM Architectural features and Instructions.
CO2	Develop programs using ARM instruction set for an ARM Microcontroller.
CO3	Explain C-Compiler Optimizations and portability issues in ARM Microcontroller.
CO4	Apply the concepts of Exceptions and Interrupt handling mechanisms in developing applications.
CO5	Demonstrate the role of Cache management and Firmware in Microcontrollers.

SUBJECT NAME: DATABASE MANAGEMENT SYSTEM
SUBJECT CODE: BCS403

Course objectives:
● To Provide a strong foundation in database concepts, technology, and practice.
● To Practice SQL programming through a variety of database problems.
● To Understand the relational database design principles.
● To Demonstrate the use of concurrency and transactions in database.
● To Design and build database applications for real world problems.
● To become familiar with database storage structures and access techniques.

Course outcomes (Course Skill Set):
At the end of the course, the student will be able to:

CO1	Describe the basic elements of a relational database management system
CO2	Design entity relationship for the given scenario.
CO3	Apply various Structured Query Language (SQL) statements for database manipulation.
CO4	Analyze various normalization forms for the given application.
CO5	Develop database applications for the given real-world problem.
CO6	Understand the concepts related to NoSQL databases

SUBJECT NAME: Analysis & Design of Algorithms Lab
SUBJECT CODE: BCSL404

Course objectives:
● To design and implement various algorithms in C/C++ programming using suitable development tools to address different computational challenges.
● To apply diverse design strategies for effective problem-solving.
● To Measure and compare the performance of different algorithms to determine their efficiency and suitability for specific tasks.

Course outcomes (Course Skill Set):
At the end of the course the student will be able to:

CO1	Develop programs to solve computational problems using suitable algorithm design strategy
CO2	Compare algorithm design strategies by developing equivalent programs and observing running times for analysis (Empirical)..
CO3	Make use of suitable integrated development tools to develop programs
CO4	Choose appropriate algorithm design techniques to develop solution to the computational and complex problems.
CO5	Demonstrate and present the development of program, its execution and running time(s) and record the results/inferences.

SUBJECT NAME: DISCRETE MATHEMATICAL STRUCTURES
SUBJECT CODE: BCS405A

Course objectives:
- To help students to understand discrete and continuous mathematical structures.
- To impart basics of relations and functions.
- To facilitate students in applying principles of Recurrence Relations to find the generating functions and solve the Recurrence relations.
- To have the knowledge of groups and their properties to understand the importance of algebraic properties relative to various number systems.

Course outcome (Course Skill Set)
At the end of the course, the student will be able to:

CO1	Apply concepts of logical reasoning and mathematical proof techniques in proving theorems and statements.
CO2	Demonstrate the application of discrete structures in different fields of computer science.
CO3	Apply the basic concepts of relations, functions and partially ordered sets for computer representations
CO4	Solve problems involving recurrence relations and generating functions
CO5	Illustrate the fundamental principles of Algebraic structures with the problems related to computer science & engineering

SUBJECT NAME: GRAPH THEORY
SUBJECT CODE: BCS405B
<u>**Course objectives:**</u>
● Understand the basic concepts of graphs and their properties, and operations of graphs.
● Hamiltonian and Euler graphs, trees and matrix representation of the graph.
● Apply the concepts of a planar graph, matching and coloring in computer science engineering.

Course outcome (Course Skill Set)
At the end of the course, the student will be able to:

CO1	Explain the fundamental concepts of properties and representation of graphs.
CO2	Solve the problems involving characterization and operations on graphs.
CO3	Apply concepts of trees and graph connectivity to solve real world problems.
CO4	Apply the concepts of planar graph and graph representations to solve the given problem.
CO5	Use the concepts of matching and coloring of graphs to solve the real world problems.

SUBJECT NAME: OPTIMIZATION TECHNIQUE
SUBJECT CODE: BCS405C
<u>**Course objectives:**</u>
The objectives of the course are to facilitate the learners to:
• Appreciate the importance of linear algebra in computer science and allied engineering science.
• Gain the knowledge of linear algebra tools and concepts to implement them in their core domain.
• Improve their mathematical thinking and acquire skills required for sustained lifelong learning

Course outcome (Course Skill Set)
At the end of the course, the student will be able to:

CO1	Apply the concepts of vector calculus to solve the given problem.
CO2	Apply the concepts of partial differentiation in machine learning and deep neural Networks
CO3	Analyze the convex optimization algorithms and their importance in computer science & engineering.
CO4	Apply the optimization algorithms to solve the problem
CO5	Analyze the advanced optimization algorithms for machine learning ..

SUBJECT NAME: LINEAR ALGEBRA
SUBJECT CODE: BCS405D
Course objectives:
● To equip the students with standard concepts and tools in Linear algebra which will find them useful in their disciplines.
● Gain the knowledge of linear algebra tools and concepts to implement them in their core domain.
● Improve their mathematical thinking and acquire skills required for sustained lifelong learning.

Course outcome (Course Skill Set)
At the end of the course, the student will be able to:

CO1	Explain the concepts of vector spaces, subspaces, bases, dimension and their properties.
CO2	Use matrices and linear transformations to solve the given problem.
CO3	Compute Eigenvalues and Eigenvectors for the linear transformations
CO4	Determine orthogonality of inner product spaces.
CO5	Apply the optimization techniques to solve the problems.

SUBJECT NAME: Green IT and Sustainability
SUBJECT CODE: BCS456A
Course objectives:
• Understand challenges for Green ICT and the environmental impact.
• Learn different aspects of ICT metrics and Sustainable Cloud Computing.
• Explore effects of software design on the sustainability.

Course outcome (Course Skill Set)
At the end of the course the student will be able to

CO1	Classify the challenges for Green ICT
CO2	Relate the environmental impact due to emerging technologies.
CO3	Demonstrate different aspects of ICT metrics.
CO4	Compare the various parameters related to Sustainable Cloud Computing

SUBJECT NAME: Capacity Planning for IT
SUBJECT CODE: BCS456B
Course objectives:
• Understand requirement and measurements for capacity planning, measurement and monitoring.
• Measurement of data for prediction towards the planning process.
• Understand concepts related to deployment, installation, configuration, and management.
• Role of virtualization and cloud services in capacity planning.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1	Identify the requirement and measurements for capacity planning by considering the goal, issues, and processes.
CO2	Explain capacity measurement and monitoring.
CO3	Make use of measurement data for prediction towards overall planning process.
CO4	Explain the concepts related to deployment, installation, configuration, and management.
CO5	Demonstrate how the virtualization and cloud services fit into a capacity plan.

SUBJECT NAME: UI/UX
SUBJECT CODE: BCS456C
Course objectives:
● Understand user experience design requirements, with design goals, metrics and targets.
● Explore different prototyping methods, UX design principles with case examples.
● Understand the role of design thinking concepts and mental models in UX design.

Course outcome (Course Skill Set)

At the end of the course the student will be able to:

CO1	Explain the user experience design requirements.
CO2	Relate design thinking concepts and mental models to UX design.
CO3	Illustrate UX design in line with design goals, metrics and targets.
CO4	Demonstrate different prototyping in relation with software engineering.

Technical Writing using LaTeX
BCSL456D
Course objectives:
● To introduce the basic syntax and semantics of the LaTeX scripting language
● To understand the presentation of tables and figures in the document
● To illustrate the LaTeX syntax to represent the theorems and mathematical equations
● To make use of the libraries (Tikz, algorithm) to design the diagram and algorithms in the document

Course outcomes (Course Skill Set):

At the end of the course, the student will be able to:

CO1	Apply basic LaTeX command to develop simple document
CO2	Develop LaTeX script to present the tables and figures in the document
CO3	Illustrate LaTeX script to present theorems and mathematical equations in the document
CO4	Develop programs to generate the complete report with citations and a bibliography
CO5	Illustrate the use of Tikz and algorithm libraries to design graphics and algorithms in the document