Course Outcomes

Semester: III — Scheme: 2022

1. Course Name: Mathematics for Computer Science BCS301

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

2. Course Name: 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.

3. OPERATING SYSTEMS BCS303

CO1	Explain the structure and functionality of operating system
CO2	Apply appropriate CPU scheduling algorithms for the given problem.
CO3	Analyse the various techniques for process synchronization and deadlock handling.
CO4	Apply the various techniques for memory management
CO5	Explain file and secondary storage management strategies.
CO6	Describe the need for information protection mechanisms

4. DATA STRUCTURES AND APPLICATIONS BCS304

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 Binary Search Trees

5. DATA STRUCTURES AND APPLICATIONS LAB BCS305

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

6. Object Oriented Programming with JAVA BCS306A

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

7. Object Oriented Programming with C++ BCS306B

CO1	Illustrate the basic concepts of object-oriented programming.
CO2	Design appropriate classes for the given real world scenario.
CO3	Apply the knowledge of compile-time / run-time polymorphism to solve the given problem

CO4	Use the knowledge of inheritance for developing optimized solutions
CO5	Apply the concepts of templates and exception handling for the given problem
CO6	Use the concepts of input output streams for file operations

8. Social Connect & Responsibility BSCK307

CO1	Communicate and connect to the surrounding.
CO2	Create a responsible connection with the society.
CO3	Involve in the community in general in which they work.
CO4	Notice the needs and problems of the community and involve them in problem – solving.
CO5	Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems..
CO6	Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes

9. Data Analytics with Excel BCS358A

CO1	Use advanced functions and productivity tools to assist in developing worksheets.
CO2	Manipulate data lists using Outline and PivotTables.
CO3	Use Consolidation to summarise and report results from multiple worksheets.
CO4	Apply Macros and Autofilter to solve the given real world scenario.

10. R- Programming BCS358B

CO1	Explain the fundamental syntax of R data types, expressions and the usage of the R-Studio IDE
CO2	Develop a program in R with programming constructs: conditionals, looping and functions.
CO3	Apply the list and data frame structure of the R programming language.
CO4	Use visualization packages and file handlers for data analysis..

11. **Project Management with Git BCS358C**

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	Analyse and change the git history

12. Data Visualization with Python BCS358D

CO1	Demonstrate the use of IDLE or PyCharm IDE to create Python Applications
CO2	Use Python programming constructs to develop programs for solving real-world problems
CO3	Use Matplotlib for drawing different Plots
CO4	Demonstrate working with Seaborn, Bokeh for visualization.
CO5	Use Plotly for drawing Time Series and Maps.

Course Outcomes

Semester: IV — Scheme: 2022

1. Course Name: ANALYSIS & DESIGN OF ALGORITHMS (BCS401)

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	Analyse various classes (P,NP and NP Complete) of problems
CO6	Illustrate backtracking, branch & bound and approximation methods.

2. Course Name: ADVANCED JAVA (BIS402)

CO1	Apply appropriate collection class/interface to solve the given problem
CO2	Demonstrate the concepts of String operations in Java
CO3	Apply the concepts of Swings to build Java applications
CO4	Develop web based applications using Java servlets and JSP
CO5	Use JDBC to build database applications

3. Course Name: Course Name: DATABASE MANAGEMENT SYSTEM (BCS403)

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	Analyse 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.

4. Course Name: Analysis & Design of Algorithms Lab (BCSL404)

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.

5. Course Name: DISCRETE MATHEMATICAL STRUCTURES (BCS405A)

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.

6. Course Name: GRAPH THEORY (BCS405B)

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.

7. Course Name: OPTIMIZATION TECHNIQUE (BCS405C)

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 .

8. LINEAR ALGEBRA (BCS405D)

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.

9.Green IT and Sustainability(BCS456A)

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.
CO5	Interpret the effects of software design on the sustainability.

10.Capacity Planning for IT (BCS456B)

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.

11.UI/UX (BCS456C)

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.
CO5	Explain UX design principles with case examples.

12.Technical Writing using LaTeX (BCSL456D)

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

Course Outcomes

Semester: V

Scheme: 2022

Software Engineering & Project Management(BCS501)

CO1	Differentiate process models to judge which process model has to be adopted for the given scenarios
CO2	Derive both functional and nonfunctional requirements from the case study
CO3	Analyze the importance of various software testing methods and agile methodology.
CO4	Illustrate the role of project planning and quality management in software development
CO5	Identify appropriate techniques to enhance software quality.

COMPUTER NETWORKS (BCS502)

CO1	Explain the fundamentals of computer networks
CO2	Apply the concepts of computer networks to demonstrate the working of various layers and protocols in communication network.
CO3	Analyze the principles of protocol layering in modern communication systems
CO4	Demonstrate various Routing protocols and their services using tools such as Cisco packet tracer.
CO5	Demonstrate various Routing protocols and their services using tools such as Cisco packet tracer.

THEORY OF COMPUTATION (BCS503)

CO1	Apply the fundamentals of automata theory to write DFA, NFA, Epsilon-NFA and conversion between them.
CO2	Prove the properties of regular languages using regular expressions.
CO3	Design context-free grammars (CFGs) and pushdown automata (PDAs) for formal languages.
CO4	Design Turing machines to solve the computational problems.
CO5	Explain the concepts of decidability and undecidability.

DATA VISUALIZATION LAB (BAIL504)

CO1	Design the experiment to create basic charts and graphs using Tableau and Power BI
CO2	Develop the solution for the given real world problem.
CO3	Analyze the results and produce substantial written documentation.

Computer Vision(BAI515A)

CO1	Explain the fundamental concepts of computer vision which helps to understand AI applications.
CO2	Apply Linear Filters, Fourier transforms and segmentation in computer vision.
CO3	Analyze Hough transformations, segmentation methods, Shot Boundary Detection and Background Subtraction in computer vision.
CO4	Develop computer vision applications using appropriate tools for a given scenario.

ARTIFICIAL INTELLIGENCE (BCS515B)

CO1	Explain the fundamental concepts of computer vision which helps to understand AI applications.
CO2	Apply problem-solving agents and various search strategies to solve a given problem.
CO3	Illustrate logical reasoning and knowledge representation using propositional and first-order logic.
CO4	Describe classical planning in the context of artificial intelligence, including its goals, constraints, and applications in problem-solving.

UNIX SYSTEM PROGRAMMING (BCS515C)

CO1	Demonstrate the basics of Unix concepts and commands.
CO2	Demonstrate the UNIX file system.
CO3	Apply comands to reflect changes in file system
CO4	Demonstrate IPC and process management.
CO5	Develop an application/service over a Unix system.

DISTRIBUTED SYSTEMS (BCS515D)

CO1	Identify the goals and challenges of distributed systems
CO2	Demonstrate the remote invocation techniques for communication
CO3	Describe the architecture of distributed file systems and name services
CO4	Apply clock synchronization algorithms to monitor and order the events.
CO5	Illustrate the fundamental concepts and algorithms related to distributed transactions and replication
CO6	Illustrate the fundamental concepts and algorithms related to distributed transactions and replication

Course Outcomes

Semester: VI — Scheme: 2022

FULL STACK DEVELOPMENT(BIS601)

CO1	Apply Javascript to build dynamic and interactive Web projects .
CO2	Implement user interface components for JavaScript-based Web using React.JS
CO3	Apply Express/Node to build web applications on the server side.
CO4	Develop data model in an open source nosql database.
CO5	Demonstrate modularization and packing of the front-end modules .

MACHINE LEARNING (BCS602)

CO1	Describe the machine learning techniques, their types and data analysis framework.
CO2	Apply mathematical concepts for feature engineering and perform dimensionality reduction to enhance model performance.
CO3	Develop similarity-based learning models and regression models for solving classification and prediction tasks.
CO4	Build probabilistic learning models and design neural network models using perceptrons and multilayer architectures
CO5	Utilize clustering algorithms to identify patterns in data and implement reinforcement learning techniques

BLOCKCHAIN TECHNOLOGY (BCS613A)

CO1	Explain the Blockchain terminologies with its applications. design
CO2	Illustrate the working principles of Blockchain and the Smart Contract Lifecycle
CO3	Demonstrate the principles and methodologies used in Bitcoin
CO4	Develop Ethereum Network, Wallets, Nodes, Smart contract and DApps.
CO5	Make use of Hyperledger in Blockchain Based Application Architecture.

INTERNET OF THINGS(BIS613B)

CO1	Explain the fundamentals of IoT and its architecture
CO2	Compare IoT access technology IEEE 802.15.4 with few other related standards.
CO3	Summarize network layer and application protocols in the view of IoT.
CO4	Explain the data analytics concepts for IoT and Security concerns.
CO5	Apply IoT concepts on an opensource IoT platform for the given real-world problem /scenario.

COMPILER DESIGN (BCS613C)

CO1	Understand the different phases of compiler design techniques
CO2	Analyse the working of lexical analyser in design of compilers
CO3	Design syntax analyser using top down and bottom up approaches
CO4	Illustrate syntax-directed translation for a given grammar.
CO5	Explain intermediate code representation and code generation of compilers

CLOUD COMPUTING & SECURITY (BIS613D)

CO1	Describe various cloud computing platforms and service providers.
CO2	Illustrate the significance of various types of virtualization.
CO3	Identify the architecture, delivery models and industrial platforms for cloud computing based applications.
CO4	Analyze the role of security aspects in cloud computing.
CO5	Demonstrate different sorting and searching algorithms and determine their algorithmic complexities.

INTRODUCTION TO DATA STRUCTURES(BCS654A)

CO1	Develop C programs utilizing fundamental concepts such as arrays, pointers and structures.
CO2	Apply data structures like stacks and queues to solve problems.
CO3	Develop C programs using linked lists and their various types.
CO4	Explain the fundamental concepts of trees and their practical applications.
CO5	Demonstrate different sorting and searching algorithms and determine their algorithmic complexities.

FUNDAMENTALS OF OPERATING SYSTEMS (BCS654B)

CO1	Explain the fundamentals of operating systems.
CO2	Apply appropriate CPU scheduling algorithm for the given scenarios.
CO3	Analyse the various techniques for process synchronization and deadlock handling.
CO4	Apply the various techniques for memory management
CO5	Analyse the importance of File System Mounting and File Sharing

MOBILE APPLICATION DEVELOPMENT (BIS654C)

CO1	Explain Mobile Application Ecosystem like concepts, architecture, and lifecycle of mobile applications on Android
CO2	Identify the key components of mobile application frameworks and development tools.
CO3	Apply design principles to create intuitive and responsive user interfaces using appropriate UI/UX tools.
CO4	Develop Functional Mobile Applications -Integrate core functionalities such as layouts, event handling, navigation, and multimedia support into applications.
CO5	Implement local data storage mechanisms (SQLite, Shared Preferences) and external databases (Firebase, APIs) for mobile applications.

INTRODUCTION TO ARTIFICIAL INTELLIGENCE

CO1	Identify the problems where the adaptation of AI has significant impact.
CO2	Analyse the different approaches of Knowledge Representation.
CO3	Explain Symbolic Reasoning under Uncertainty and Statistical reasoning.
CO4	Derive the importance of different types of Learning Techniques.
CO5	Explain Natural Language Processing and Expert System.

Machine Learning lab (BCSL606)

CO1	Illustrate the principles of multivariate data and apply dimensionality reduction techniques.
CO2	Demonstrate similarity-based learning methods and perform regression analysis.
CO3	Develop decision trees for classification and regression problems, and Bayesian models for probabilistic learning
CO4	Implement the clustering algorithms to share computing resources.

TOSCA – Automated Software testing (BIS657A)

CO1	Explain of Tosca's architecture, key features and fundamentals of the Tosca automation tool.
CO2	Develop test scenarios that can be run automatically.
CO3	Construct test cases and modules in the Tosca automation tool.
CO4	Design Test Suits and run tests in different browsers.

Generative AI (BAIL657C)

CO1	Develop the ability to explore and analyze word embeddings, perform vector arithmetic to investigate word relationships, visualize embeddings using dimensionality reduction techniques
CO2	Apply prompt engineering skills to real-world scenarios, such as information retrieval, text generation
CO3	Utilize pre-trained Hugging Face models for real-world applications, including sentiment analysis and text summarization.

CO4	Apply different architectures u

DEVOPS (BCSL657D)

CO1	Demonstrate different actions performed through Version control tools like Git.
CO2	Perform Continuous Integration and Continuous Testing and Continuous Deployment using Jenkins by building and automating test cases using Maven & Gradle.
CO3	Experiment with configuration management using Ansible.
CO4	Demonstrate Cloud-based DevOps tools using Azure DevOps.