

Department of computer Science and Engineering

CO's 2022 Scheme

SEMESTER –II

Introduction to C Programming

BESCK104E/204E

Course Outcomes (Course Skill Set)

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

1. CO1. Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.
2. CO 2. Apply programming constructs of C language to solve the real world problem
3. CO 3. Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting
4. CO 4. Explore user-defined data structures like structures, unions and pointers in implementing solutions
5. CO5.Design and Develop Solutions to problems using modular programming constructs using functions

Introduction to Python Programming

BPLCK105B/205B

Course outcome (Course Skill Set)

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

1. CO1 Demonstrate proficiency in handling loops and creation of functions.
2. CO2 Identify the methods to create and manipulate lists, tuples and dictionaries.
3. CO3 Develop programs for string processing and file organization
4. CO4 Interpret the concepts of Object-Oriented Programming as used in Python.

Introduction to C++ Programming

BPLCK105D/BPLCK205D

Course outcome (Course Skill Set)

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

1. CO1 Able to understand and design the solution to a problem using object-oriented programming concepts.
2. CO2 Able to reuse the code with extensible Class types, User-defined operators and function Overloading.
3. CO3 Achieve code reusability and extensibility by means of Inheritance and Polymorphism
4. CO4 Implement the features of C++ including templates, exceptions and file handling for providing programmed solutions to complex problems.

Basics of Java Programming

BPLCK105C/BPLCK205C

Course outcome (Course Skill Set)

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

1. CO1 To explain the features and object oriented concepts in JAVA programming
2. CO2 To analyse working of bitwise operators in JAVA
3. CO3 To develop simple programs based on polymorphism and inheritance
4. CO4 To describe the concepts of importing packages and exception handling mechanism

Principles of Programming using C

BPOPS103/203

Course Outcomes (Course SkillSet)

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

1. CO1. Elucidate the basic architecture and functionalities of a computer and also recognize the hardware parts.
2. CO 2. Apply programming constructs of C language to solve the real world problem
3. CO 3.Explore user-defined data structures like arrays in implementing solutions to problems like searching and sorting
4. CO 4.Explore user-defined data structures like structures, unions and pointers in implementing solutions

Introduction to Web Programming

BPLCK105A/BPLCK205A

Course outcome (Course Skill Set)

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

1. CO1 Explain the historical context and justification for HTML over XHTML
2. CO2 Develop HTML5 documents and adding various semantic markup tags
3. CO3 Analyse various attributes, values and types of CSS
4. CO4 Implement core constructs and event handling mechanisms of JavaScript.

Mathematics for Computer Science**BCS301****Course outcome (Course Skill Set)**

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

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

Digital Design and Computer Organization**BCS302****Course outcomes (Course Skill Set):**

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

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

OPERATING SYSTEMS

BCS303

Course outcomes (Course Skill Set):

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

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

DATA STRUCTURES AND APPLICATIONS

BCS304

Course outcome (Course Skill Set)

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

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

Object Oriented Programming with JAVA

BCS306A

Course outcome (Course Skill Set)

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

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

OBJECT ORIENTED PROGRAMMING with C++

BCS306B

Course outcome (Course Skill Set)

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

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

Social Connect & Responsibility

BSCK307

Course outcomes (Course Skill Set):

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

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

Data Analytics with Excel

BCS358A

Course outcomes (Course Skill Set):

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

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

R Programming

BCS358B

Course outcomes (Course Skill Set):

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

1. Explain the fundamental syntax of R data types, expressions and the usage of the R-Studio IDE

2. Develop a program in R with programming constructs: conditionals, looping and functions.
3. Apply the list and data frame structure of the R programming language.
4. Use visualization packages and file handlers for data analysis..

Project Management with Git

BCS358C

Course outcomes (Course Skill Set):

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

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

Data Visualization with Python

BCS358D

Course outcomes (Course Skill Set):

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

1. CO 1. Demonstrate the use of IDLE or PyCharm IDE to create Python Applications
2. CO 2. Use Python programming constructs to develop programs for solving real-world problems
3. CO 3. Use Matplotlib for drawing different Plots
4. CO 4. Demonstrate working with Seaborn, Bokeh for visualization.
5. CO 5. Use Plotly for drawing Time Series and Maps.

SEMESTER –IV

Analysis & Design of Algorithms**BCS401****Course outcome (Course Skill Set)**

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

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
6. Illustrate backtracking, branch & bound and approximation methods.

MICROCONTROLLERS**BCS402****Course outcomes (Course Skill Set):**

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

1. Explain the ARM Architectural features and Instructions.
2. Develop programs using ARM instruction set for an ARM Microcontroller.
3. Explain C-Compiler Optimizations and portability issues in ARM Microcontroller.
4. Apply the concepts of Exceptions and Interrupt handling mechanisms in developing applications.
5. Demonstrate the role of Cache management and Firmware in Microcontrollers.

DATABASE MANAGEMENT SYSTEM

BCS403

Course outcomes (Course Skill Set):

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

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

Course outcomes (Course Skill Set):

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

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.

DISCRETE MATHEMATICAL STRUCTURES

BCS405A

Course outcome (Course Skill Set)

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

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.

GRAPH THEORY

BCS405B

Course outcome (Course Skill Set)

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

1. Explain the fundamental concepts of properties and representation of graphs.
2. Solve the problems involving characterization and operations on graphs.
3. Apply concepts of trees and graph connectivity to solve real world problems.
4. Apply the concepts of planar graph and graph representations to solve the given problem.
5. Use the concepts of matching and coloring of graphs to solve the real world problems.

OPTIMIZATION TECHNIQUE

BCS405C

Course outcome (Course Skill Set)

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

1. Apply the concepts of vector calculus to solve the given problem.
2. Apply the concepts of partial differentiation in machine learning and deep neural networks.
3. Analyze the convex optimization algorithms and their importance in computer science & engineering.
4. Apply the optimization algorithms to solve the problem
5. Analyze the advanced optimization algorithms for machine learning .

LINEAR ALGEBRA

BCS405D

Course outcome (Course Skill Set)

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

1. Explain the concepts of vector spaces, subspaces, bases, dimension and their properties.
2. Use matrices and linear transformations to solve the given problem.
3. Compute Eigenvalues and Eigenvectors for the linear transformations
4. Determine orthogonality of inner product spaces.
5. Apply the optimization techniques to solve the problems.

Green IT and Sustainability

BCS456A

Course outcome (Course Skill Set)

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

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.

Capacity Planning for IT

BCS456B

Course outcome (Course Skill Set)

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

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

UI/UX

BCS456C

Course outcome (Course Skill Set)

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

1. Explain the user experience design requirements.
2. Relate design thinking concepts and mental models to UX design.
3. Illustrate UX design in line with design goals, metrics and targets.
4. Demonstrate different prototyping in relation with software engineering.

Technical Writing using LaTeX

BCSL456D

Course outcomes (Course Skill Set):

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

1. Apply basic LaTeX command to develop simple document
2. Develop LaTeX script to present the tables and figures in the document
3. Illustrate LaTeX script to present theorems and mathematical equations in the document
4. Develop programs to generate the complete report with citations and a bibliography
5. Illustrate the use of Tikz and algorithm libraries to design graphics and algorithms in the document

SEMESTER –V

Software Engineering & Project Management

BCS501

Course Outcomes

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

1. Differentiate process models to judge which process model has to be adopted for the given scenarios.
2. Derive both functional and nonfunctional 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

Course outcomes (Course Skill Set):

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

1. Explain the fundamentals of computer networks.
2. Apply the concepts of computer networks to demonstrate the working of various layers and protocols 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

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

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.

Web Technology Lab

BCSL504

Course outcomes (Course Skill Set):

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

1. Design the experiment for the given problem using HTML, Javascript and CSS.
2. Develop the solution for the given real-world problem using jQuery, Ajax and PHP.
3. Analyze the results and produce substantial written documentation.

COMPUTER GRAPHICS

BAI515A

Course outcome (Course Skill Set)

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

1. Explain the fundamentals of computer graphics systems.
2. Develop event driven graphical applications by interfacing hardware devices.
3. Apply the Geometrical Transformations on geometrical objects.
4. Apply the concepts of viewing, lighting and shading on graphical objects.
5. Demonstrate algorithms for 2D graphical primitives.

ARTIFICIAL INTELLIGENCE

BCS515B

Course outcomes (Course Skill Set)

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

1. Explain the architecture and components of intelligent agents, including their interaction with the AI environment.
2. Apply problem-solving agents and various search strategies to solve a given problem.
3. Illustrate logical reasoning and knowledge representation using propositional and first-order logic.
4. Demonstrate proficiency in representing knowledge and solving problems using first-order logic.
5. Describe classical planning in the context of artificial intelligence, including its goals, constraints, and applications in problem-solving.

UNIX SYSTEM PROGRAMMING

BCS515C

Course outcome (Course Skill Set)

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

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.

DISTRIBUTED SYSTEMS

BCS515D

Course outcome (Course Skill Set)

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

1. Identify the goals and challenges of distributed systems
2. Demonstrate the remote invocation techniques for communication
3. Describe the architecture of distributed file systems and name services
4. Apply clock synchronization algorithms to monitor and order the events.
5. Analyze the performance of mutual exclusion, election and consensus algorithms.

6. Illustrate the fundamental concepts and algorithms related to distributed transactions and replication