B.Sc. Physical Science with Computer Science

Learning Outcomes

SEMESTER-I

DSC-1: PROGRAMMING FUNDAMENTALS USING C++

Learning Objective

This course is designed to introduce programming concepts using C++ to students. The course aims to develop structured as well as object-oriented programming skills using C++ programming language. The course also aims to achieve competence amongst its students to develop correct and efficient C++ programs to solve problems spanning multiple domains.

Learning Outcomes:

On successful completion of the course, students will be able to:

- Write simple programs using built-in data types of C++.
- Implement arrays and user defined functions in C++.
- Write programs using dynamic memory allocation, handling external files, interrupts and exceptions.
- Solve problems spanning multiple domains using suitable programming constructs in C++.
- Solve problems spanning multiple domains using the concepts of object oriented programming in C++.

GE: PROGRAMMING WITH PYTHON

Learning Objectives

The course is designed to introduce programming concepts using Python to students. The course aims to develop structured as well as object-oriented programming skills using Python. The course also aims to achieve competence amongst its students to develop correct and efficient Python programs to solve problems in their respective domains.

Learning Outcomes

On successful completion of the course, students will be able to:

- Write simple programs using built-in data structures in Python.
- Implement arrays and user defined functions in Python.
- Solve problems in the respective domain using suitable programming constructs in Python. Solve problems in the respective domain using the concepts of object oriented programming in Python.

SEMESTER -II

DSC 02: DATA STRUCTURES

Learning Objective

The course aims at developing the ability to define, differentiate, implement the basic data structures like arrays, stacks, queues, lists, trees and use them to solve problems. C++ is chosen as the language to understand implementation of these data structures.

Learning Outcomes

On successful completion of the course, students will be able to:

- Compare two functions for their rates of growth.

- Understand abstract specification of data-structures and their implementation.
- Compute time and space complexity of operations on a data-structure.
- Identify the appropriate data structure(s) for a given application and understand the
- trade-offs involved in terms of time and space complexity.
- Apply recursive techniques to solve problems.

GE: DATA ANALYSIS AND VISUALIZATION USING PYTHON

Learning Objective

- This course is designed to introduce the students to real-world data analysis problems, their analysis and interpretation of results in the field of exploratory data science using Python. Course

Learning Outcomes

On successful completion of the students will able to

- Apply descriptive statistics to obtain a deterministic view of data
- Perform data handling using Numpy arrays
- Load, clean, transform, merge and reshape data using Pandas
- Visualize data using Pandas and matplot libraries

SEMESTER -III

DSC 03: COMPUTER SYSTEM ARCHITECTURE

Learning Objective

This course introduces the students to fundamental concepts of digital computer organization, design and architecture. It aims to develop a basic understanding of the building blocks of

computer system and highlights how these blocks are organized together to architect a digital computer system.

Learning Outcomes

- On successful completion of the course, students will be able to:
- Design Combinational Circuits using basic building blocks. Simplify these circuits using Boolean algebra and Karnaugh maps. Differentiate between combinational circuits and sequential circuits.
- Represent data in binary form, convert numeric data between different number systems and perform arithmetic operations in binary.
- Determine various stages of the instruction cycle and describe interrupts and their handling.
- Explain how the CPU communicates with memory and I/O devices.
- Simulate the design of a basic computer using a software tool.

GE: DATABASE MANAGEMENT SYSTEM

Learning Objective

- The course introduces the students to the fundamentals of database management system and its applications. Emphasis is given on the popular relational database system. Students will learn about the importance of database structure and its designing using Entity Relationship diagram and formal approach using normalization. Basic concepts of file indexing and transaction processing will be taught. The course would give students hands-on practice of structured query language to create, manipulate and implement a relational database.

Learning Outcomes

On successful completion of the course, students will be able to:

- Use relational database management software to create and manipulate the database.
- Create conceptual data models using entity relationship diagrams for modeling real-life situations and map it to corresponding relational database schema.
- Use the concept of functional dependencies to remove redundancy and update anomalies. Apply normalization theory to get a normalized database scheme to get anomalies free database.
- Write queries in relational algebra.
- Implement relational databases and formulate queries for data retrieval and data update problems using SQL.
- Learn the importance of index structures and concurrent execution of transactions in database systems.

SEMESTER -IV

DSC 04: OPERATING SYSTEMS

Learning Objective

The course introduces Operating System and its importance in computer systems. The focus is to explain the common services provided by an operating system like process management, memory (primary, secondary & virtual) management, I/O management, file management. The course talks about the various functional components of The operating and their design.

Learning Outcomes

At the successful completion of the course, students will also be able to gain knowledge of different concepts of the operating System and its components. They would learn about shell scripts and would be able to use the system in an efficient manner.

GE: INTRODUCTION TO WEB PROGRAMMING

Learning Objective

The course aims at introducing the basic concepts and techniques of client side web programming. The student shall be able to develop simple websites using HTML, CSS and Javascript.

Learning Outcomes

On successful completion of this course, the student will be able to:

- Build websites using the elements of HTML.
- Build dynamic websites using the client side programming techniques with CSS and Javascript.
- Learn to validate client-side data

SEMESTER -V

DSE 1: Data Structures (BSCS05A)

Learning Outcomes

- Demonstrate a thorough understanding of the behavior of basic data structures.
- Implement data structures efficiently in programming language C++.

- Demonstrate an understanding of recursion by applying recursive techniques to solve problems.

DSE 2: Digital Image Processing (BSCS05B)

Learning Outcomes

- Describe general terminology of Digital Image Processing and the roles of image processing
- systems in a variety of applications.
- Describe the basic issues and the scope (or principal applications) of image processing.
- explain representation and manipulation of digital images, image acquisition, reading, writing, enhancement, displaying and segmentation and image Fourier transform.
- Examine various types of images, intensity transformations and spatial filtering.

SEC: Programming in C++ (BSCS08A)

Learning Outcomes

- Solve simple programming problems using iteration and selection, and basic constructs: Structures, arrays and functions.
- Create classes and their objects and use access specifies for data hiding depicting advantage of Abstraction.
- construct classes for code reusability depicting advantage of Inheritance.
- Implement Function Overloading depicting advantage of Polymorphism.
- Create file, read/write from/to files.

Programming in Java (BSCS08B)

Learning Outcomes

- Develop and execute Java programs using iteration and selection.
- Create classes and their objects.
- Implement OOPS concepts to solve problems using JAVA

SEMESTER -VI

DSE 1: Computer Networks (BSCS06A)

Learning Outcomes

- Understand the basics of data communication.
- Differentiate between various types of computer networks and their topologies.
- Understand the difference between the OSI and TCP/IP protocol suit.
- Explain merits and demerits of different types of communication media.
- Distinguish between different types of network devices and their functions.
- Use IP addressing and understand the need of various application layer protocols.

DSE 2: Analysis of Algorithms (BSCS06B)

Learning Outcomes

- Understand the idea of algorithm analysis.
- Understand characteristics of searching and sorting algorithms and compare efficiency of different solutions for an application at hand. Model simple problems as graphs and solve those using graph algorithms.

DSE 3: Project Work / Dissertation (BSCS06C)

Learning Outcomes

- Develop a project plan based on informal description of the project.
- Implement the project as a team.
- Write a report on the project work carried out by the team and defend the work done by the team collectively.
- Present the work done by the team to the evaluation committee.