

## **Program Outcome for the Courses- BSc Physical Science/Mathematical Science**

The objective of BSc Physical Science/Mathematical Science Programme with Computer Science is to introduce the discipline to students who want to pursue either higher studies in science or branch off to other disciplines for higher studies, or those who want to be educators. Specifically, the program aims the following achievements for students.

1. To attain understanding of computer systems, their applications and fundamentals.
2. To develop ability to apply knowledge of computing to solve computational problems.
3. To analyze a problem, and identify the computing requirements appropriate to its solution.
4. To design, implement, and evaluate a computer-based system, process or program to meet the desired needs.
5. To communicate effectively with a range of audiences

The following is the subject wise- semester wise details of the outcome and objective of each subject taught under this course.

### **Problem Solving using Computers (BSCS01) Core Course - (CC)**

#### **Course Objective:**

This course is designed as the first course in programming to develop problem solving skills. The course focuses on modularity, reusability, code documentation, and debugging skills. It also introduces the concept of object-oriented programming.

#### **Course Learning Outcomes**

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

1. describe the components of a computer and the notion of an algorithm.
2. apply suitable programming constructs and data structures to solve a problem.
3. develop, document, and debug modular python programs.
4. use classes and objects in application programs.
5. use files for I/O operations.

### **Database Management Systems (BSCS02) Core Course - (CC)**

#### **Course Objective**

The course introduces the students to the fundamentals of database management systems and methods to store and retrieve data. The course would give students hands-on practice of

structured query language in a relational database management system.

### **Course Learning Outcomes**

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

1. use database management system to manage data.
2. create entity relationship diagrams for modeling real-life situations and design the database schema.
3. use the concept of functional dependencies to remove data anomalies and arrive at normalized database design.
4. write queries using relational algebra and SQL.

### **Operating Systems (BSCS03) Core Course - (CC)**

#### **Course Objective**

This course introduces Operating System concepts and its importance in computer system. It focuses on the basic facilities provided in modern operating systems.

#### **Course Learning Outcomes**

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

1. understand the rationale behind the current design and implementation decisions in modern Operating Systems by considering the historic evolution.
2. identify modules of the operating systems and learn about important functions performed by operating system as resource manager.
3. use the OS in a more efficient manner.

### **Computer System Architecture (BSCS04) Core Course - (CC)**

#### **Course Objective**

The course will introduce students to the fundamental concepts of digital computer organization, design and architecture. It aims to develop a basic understanding of the design of a computer system.

#### **Course Learning Outcomes**

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

1. design combinational circuits using basic building blocks. Simplify these circuits using Boolean Algebra and Karnaugh maps.
2. differentiate between combinational circuits and sequential circuits
3. represent data in binary form, convert numeric data between different number

systems and perform arithmetic operations in binary.

4. determine various stages of instruction cycle, various instruction formats and instruction set.
5. describe interrupts and their handling.
6. explain how CPU communicates with memory and I/O devices.

## **Data Structures (BSCS05A) Discipline Specific Elective - (DSE)**

### **Course Objective**

The course introduces the students to the fundamentals of data structures. Students will learn about arrays, stacks, queues, linked lists, recursion and trees.

### **Course Learning Outcomes**

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

1. demonstrate a thorough understanding of the behaviour of basic data structures.
2. implement data structures efficiently in programming language C++.
3. demonstrate an understanding of recursion by applying recursive techniques to solve problems.

## **Digital Image Processing (BSCS05B) Discipline Specific Elective - (DSE)**

### **Course Objective**

The course introduces the basic concepts and methodologies of digital image processing. The topics covered include image enhancement, spatial and frequency domain, image filtering, morphological image processing and image segmentation.

### **Course Learning Outcomes**

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

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

## **Computer Networks (BSCS06A) Discipline Specific Elective - (DSE)**

### **Course Objective**

This course provides an overview of the concepts of data communication and computer networks. Network topologies and their characteristics, different type of networks, transmission media along with their limitations and use, different protocols used in application layer are covered.

### **Course Learning Outcomes**

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

1. understand the basics of data communication.
2. differentiate between various types of computer networks and their topologies.
3. understand the difference between the OSI and TCP/IP protocol suit.
4. explain merits and demerits of different types of communication media.
5. distinguish between different types of network devices and their functions.
6. use IP addressing and understand the need of various application layer protocols.

## **Analysis of Algorithms (BSCS06B) Discipline Specific Elective - (DSE)**

### **Course Objective**

The course provides techniques for design and analysis of algorithms. Topics include sorting, searching, heaps, divide and conquer, greedy and dynamic programming, and graph algorithms.

### **Course Learning Outcomes**

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

1. understand the idea of algorithm analysis.
2. understand characteristics of searching and sorting algorithms and compare efficiency of different solutions for an application at hand.
3. model simple problems as **graphs** and solve those using graph algorithms.

## **Project Work / Dissertation (BSCS06C) Discipline Specific Elective - (DSE)**

### **Course Objective**

The students will undergo one semester of project work based on the concepts studied in a subject of their choice. The objective is to train the students for the industry by exposing them to prototype development of real life software.

## **Course Learning Outcomes**

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

1. develop a project plan based on informal description of the project.
2. implement the project as a team.
3. write a report on the project work carried out by the team and defend the work done by the team collectively.
4. present the work done by the team to the evaluation committee.

## **Data Analysis using Python Programming (BSCS07A) Skill-Enhancement Elective Course - (SEC)**

### **Course Objective**

The course enables students to analyse data using python. They will learn how to prepare data for analysis and create meaningful data visualisations. They will learn to use Pandas, Numpy and Scipy libraries to work with different data sets.

## **Course Learning Outcomes**

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

1. develop a python script for data analysis and execute it.
2. install, load and deploy the required packages.
3. clean and prepare the data for accurate analysis.
4. analyse the data stored in files in different formats.
5. experiment with data visualization methods.

## **Introduction to R Programming (BSCS07B) Skill-Enhancement Elective Course - (SEC)**

### **Course Objective**

This course introduces statistical programming language R for data analysis. The objective is to expose the students to the strengths and capabilities of R for data analysis. It also encourages students to use open source softwares.

## **Course Learning Outcomes**

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

1. develop an R script for data analysis and execute it.
2. install, load and deploy the required packages.
3. analyse the data stored in files in different formats.
4. identify suitable data visualization and exploration methods to answer a business question.
5. interpret the results of analysis.

## **Programming in C++ (BSCS08A) Skill-Enhancement Elective Course - (SEC)**

### **Course Objective**

The course introduces Object Oriented Programming Language C++ with the objective to use object oriented features to develop efficient programs. The focus is to equip the students with adequate high-level object-oriented programming features using C++.

### **Course Learning Outcomes**

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

1. solve simple programming problems using iteration and selection, and basic constructs: structures, arrays and functions.
2. create classes and their objects and use access specifiers for data hiding depicting advantage of Abstraction.
3. construct classes for code reusability depicting advantage of Inheritance.
4. implement Function Overloading depicting advantage of Polymorphism.
5. create file, read/write from/to files.

## **Programming in Java (BSCS08B) Skill-Enhancement Elective Course - (SEC)**

### **Course Objective**

This course introduces fundamental concepts of Object Oriented Programming using Java. Basic concepts such as data types, expressions, control structures, functions and arrays are covered. Students are exposed to extensive Java programming to solve practical programming problems.

### **Course Learning Outcomes**

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

1. develop and execute Java programs using iteration and selection.
2. create classes and their objects.
3. implement OOPS concepts to solve problems using JAVA

## **Advanced Programming in Java (BSCS09A) Skill-Enhancement Elective Course - (SEC)**

### **Course Objective**

This course builds over basic Java language skills acquired by the student in earlier semester. The students are exposed to the advanced features available in Java such as exception handling, file handling, interfaces, packages and GUI programming.

### **Course Learning Outcomes**

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

1. implement Exception Handling and File Handling.
2. implement multiple inheritance using Interfaces.
3. logically organize classes and interfaces using packages
4. use AWT classes to design GUI applications.

## **Web Design using HTML5 (BSCS09B) Skill-Enhancement Elective Course - (SEC)**

### **Course Objective**

The course introduces the basics of HTML5 including CSS styling. It helps students learn how to plan and design effective web pages and producing effective websites.

### **Course Learning Outcomes**

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

1. define the principles and basics of Web page design.
2. recognize the elements of HTML.
3. apply basic concepts of CSS.
4. publish web pages.

## **Android Programming (BSCS10A) Skill-Enhancement Elective Course - (SEC)**

### **Course Objective**

The course is designed for students to learn to develop android applications. They will learn android architecture and key principles underlying its design.

### **Course Learning Outcome**

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

1. describe the design of Android operating system.
2. describe various components of Android applications.
3. design user interfaces using various widgets, dialog boxes, menus.
4. design application with interaction among various activities/applications using intents.
5. develop application(s) with database handling.

## **PHP Programming (BSCS10B) Skill-Enhancement Elective Course - (SEC)**

### **Course Objective**

This course will introduce server side scripting to students through PHP programming language. They will learn to design web applications with a specific functionality, and dynamic websites requiring handling/processing data input by users.

### **Course Learning Outcomes**

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

1. use different data types and control structures in PHP.
2. handle arrays and strings in PHP.
3. create dynamic interactive web pages with PHP.
4. use PHP built-in functions as well as define custom functions.
5. perform data validation in PHP.
6. manipulate and manage a database using PHP.