Centre for High Energy Physics
Faculty of Science
University of the Punjab, Lahore
Course Outline

Program	BSCP	Course Code	ACS 301	Credit Hours	3 (2+1Lab)
Course Title	Computer Programming				

Course Introduction
The Computer Programming course is a gateway to the dynamic world of programming languages and software development. It covers data types, variable types, control structures, arrays, functions, pointers, user-defined data types, inheritance and object-oriented programming, and parallel programming with MPI. By the end of the course, students will have a solid grasp of programming fundamentals and be well-prepared for diverse coding endeavors, from software development to scientific computing.

Learning Outcomes
The course introduces the subject of Computer Programming. Its objectives are as following.

1. Studying the basic concepts of computer programming.
2. Learning to develop algorithms and its translation into programs.
3. Get familiar with programming Languages like C, C++, FORTRAN 90/Python etc.
4. Learning Debugging and testing programs and its documentation.

Course Content	
Week 1	Introduction to Flow charts
	Flow charts of different Problems
Week 2	Introduction to Algorithm
	Algorithm of different problems
Week 3	Programming Languages: Introduction to C, C++, C#, and Python:
	Pre-processors, Code Editors, Compiler, Executor and Error handling
Week 4	Data types, Variable types,
	Control structure: Selection Statements
Week 5	Iteration/loop (For)
	Iteration/loop (while)
Week 6	Iteration/loop (Do-while)
	Programs through For, while, and Do-while loops
Week 7	(Problem Solving)
	(Problem Solving)
Week 8	One Dimensional Arrays
	Two Dimensional Arrays
Week 9	Functions

	Programs of different problems through functions
Week 10	Pointers, Pointer of a functions
	User-defined data types, Structures; Defining a structure, Defining a structure variable
Week 11	structures within structures, structures as arguments of functions
	Defining a class, creating objects of classes, Calling member functions of classes
Week 12	Constructors and Destructors, Constructor overloading,
	Objects as arguments, Returning objects from functions, static classes, Static class data types,
Week 13	Inheritance; Derived and base classes, Types of inheritance, Accessing base class members
	Abstract and concrete classes, Single and multiple inheritance, Ambiguity in multiple inheritance
Week 14	Virtual functions, Abstract classes, and virtual functions,
	Friend functions, Friend classes
Week 15	Static functions
	Accessing class members with pointer
Week 16	Introduction to parallel programming with MPI
	Programming with MPI

Textbooks and Reading Material

1. C Programming Language (2ndEdition), B. W. Kernighan, *Prentice Hall* (1988).
2. C++ How to program (9thedition), Paul Dietel and Harvey Dietel, *Pearson Education, Inc.* (2013).
3. Object Oriented Programming Using C++ (4thedition), Robert Lafore, *Sams Publishing* (2004).
4. Programming with C (2ndedition) Schaum Outlines Series, B. S. Gottfried, *McGraw Hill Press* (1996).
5. Fluent Python: Clear, Concise, and Effective Programming" by Luciano Ramalho (2015)

Teaching Learning Strategies

The instructor is required to make use of FORTRAN/C/C++/Mathematica/Python/C# to teach the concepts through visualization/antimutation and symbolic/numerical calculations. The students are required to solve a large portion of related exercises/questions/problems of the main textbooks.

Assignments: Types and Number with Calendar

At least two assignments and two quizzes. A course project may also be assigned.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.

2.	Formative Assessment	25%	Continuous assessment includes Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. At least fifty percent of the question paper would involve new problems related to the concepts learned in the course. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.