Programming Fundamentals

General Information

Course Catalog#	CSC-121
Credit Hours	3+1 (Theory Credit Hour = 3, Lab Credit Hours = 1)
Prerequisite	None
Semester	BS(CS/SE) – (I)

Course Objectives / Description

This is an introductory course to the programming language which is intended for those with little or no programming background. This course provides a conceptual and practical introduction to programming. The focus is on programming rather than the particular choice of programming language, with general principles being brought out through the study of 'C++'. This course will equip students with tools and techniques to implement a given problem programmatically.

Course Learning Outcomes (CLOs)

No.	Course Learning Outcome	Domain	Level	Assessment Tool
C1	**Understand** the basic problem-solving steps and logic constructs	C	2	Class Participation, Quizzes, Mid Exams., Assignments
C2	**Demonstrate** basic programming concepts	C	3	Class Activity, Quiz, Assignments
C3	Design and implement algorithms to **solve** real world problems.	C	3	Worksheets, Project

Domains:
C=Cognitive, A=Affective, P=Psychomotor
Levels:
Cogn itive = {1: Remembering, 2: Understanding, 3: Applying, 4: Analyzing, 5: Evaluating, 5: Creating}
Affective = {1: Receiving, 2: Responding, 3: Valuing, 4: Organizing, 5: Characterizing}
Psychomotor= {1: Imitation, 2: Manipulation, 3: Precision, 4: Articulation, 5: Naturalization}

Course Contents

Week No.	Topic	Reading	CLO

1	1.1 Computer System
	  ◦ Hardware
	  ◦ Software
	  ◦ High-Level Language
	  ◦ Compilers
	1.Programming & Problem Solving
	  ◦ Algorithms
	  ◦ Program Design
	1.3 Introduction to C++
	  ◦ A Sample C++ Program
	  ◦ Layout of a Simple C++ Program
	  ◦ Compiling and Running a C++ Program
	1.4 Testing and Debugging
	  ◦ Kinds of Program Errors
		Chapter 1	C1, C3

2 & 3	2.1 Variables and Assignments
	  ◦ Variables
	  ◦ Names: Identifiers
	  ◦ Variable Declarations
	  ◦ Assignment Statement
	2.2 Input and Output
	  ◦ Output using cout
	  ◦ Include Directives and Namespaces
	  ◦ Escape Sequences
	  ◦ Input using cin
	  ◦ Designing input and output
	2.3 Data Types and Expressions
	  ◦ The Types int and double
	  ◦ Other Number Types
	  ◦ The Type Char
	  ◦ The Type bool
	  ◦ Introduction to Class String
	  ◦ Type Compatibilities
	  ◦ Arithmetic Operators and Expressions
	  ◦
		Chapter 2	C1,C2

4 & 5	2.4 Simple Flow of Controls
	  ◦ A Simple Branching Mechanism
	  ◦ Compound Statements
	  ◦ Simple Loop Mechanisms
	  ◦ Increment and Decrement Operators
	2.5 Program Style
	  ◦ Indenting
	  ◦ Comments
	  ◦ Naming Constants
	3.1 Using Boolean Expressions
	  ◦ Evaluating Boolean Expressions
	  ◦ Enumeration Type
	3.2 Multiway Branches
	  ◦ Nested Statements
		Chapter 2 & 3	C1, C2

	◦ Multiway if-else Statements ◦ The switch Statement		
6 & 7	3.3 More About C++ Loops ◦ The while statements ◦ Increment and Decrement Operators revisited ◦ The for statement ◦ What Kind of Loop to Use ◦ The break Statement 3.4 Designing Loops ◦ Loops for Sums and Product ◦ Ending a Loop ◦ Nested Loop ◦ Debugging Loop	Chapter 3	C1,C2
8 & 9	4.1 Top Down Design 4.2 Predefined Functions ◦ Using Predefined Functions ◦ Random Number Generation ◦ Type Casting 4.3 Programmer Defined Functions ◦ Function Definition ◦ Function That return a Boolean Value ◦ Alternate Form for Function Declarations ◦ Function Definition Syntax Summary 4.5 Scope and Local Variables ◦ The Small Program Analogy ◦ Global Constants and Global Variables ◦ Call by Value Formal Parameters ◦ Block Scope ◦ Factorial Function 4.6 Overloading Function Names ◦ Introduction to Overloading ◦ Automatic Type Conversion 5.1 VOID Functions 5.2 Call by Reference Parameters 5.3 Using Procedural Abstraction ◦ Functions calling Function	Chapter 4 & 5	C1,C2
10 & 11	7.1 Introduction to Arrays ◦ Declaring and Referencing Arrays ◦ Arrays in Memory 7.2 Arrays in Functions ◦ Indexed Variables as Function Arguments ◦ Functions that return an Array 7.3 Programming with Arrays ◦ Partially Filled Arrays	Chapter 7	C1,C2

	◦ Searching/Sorting in Array
	
	7.4 Multidimensional Arrays
	  ◦ Multidimensional Array Basics
	  ◦ Multidimensional Array Parameters		

12	10.1 Structures
	  ◦ Structures for Diverse Data
	  ◦ Structures as Function Arguments
	  ◦ Initializing Structures
		Chapter 10	C1,C2

13 & 14	8.1 An Array Type for Strings
	  ◦ C-String
	  ◦ Other Functions in <cstring>
	  ◦ C-String input and output
	8.2 The Standard String Class
	  ◦ Introduction to Standard Class string
	  ◦ I/O with the Class String
	  ◦ String processing with the Class String
	  ◦ Converting between string Objects and C string
		Chapter 6 & 8	C1,C2

15	9.1 Pointers
	  ◦ Pointer Variables
	  ◦ Basic Memory Management
	  ◦ Static variables and Automatic Variables
	9.2 Dynamic Arrays
	  ◦ Array Variables and Pointer variables
	  ◦ Creating and using Dynamic Arrays
		Chapter 9	C1,C2

16	Revision	Chapter 10	C1,C2
Final Term Exam			

CLO-PLO Map

CLOs	Graduate Attribute (PLOs)											
	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CLO 1	1	1	0	0	0	0	0	0	0	0	0	0
CLO 2	0	1	0	0	0	0	0	0	0	0	0	0
CLO 3	0	1	1	1	0	0	0	0	1	1	1	1

Text Book

1. Problem Solving with C++ 10th edition by Walter Savitch- Pearson Prentice-Hall
2. Beginning Programming with C++ for Dummies by Stephen R. Davis
3. C++ for Dummies by Stephen R. Davis

Reference Material

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Books
1. Programming: Principles and Practice using C++ by Bjarne Stroustrup
2. C++ How to Program   Deitel & Deitel- Pearson Prentice-Hall

Web Tutorials
- https://www.cplusplus.com/doc/tutorial/
- https://www.geeksforgeeks.org/c-plus-plus/
- https://www.w3schools.com/CPP/default.asp

Online C++ Compilers
- https://www.onlinegdb.com/online_c++_compiler
- https://www.programiz.com/cpp-programming/online-compiler/
- https://onecompiler.com/cpp
- http://cpp.sh/

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Instructor

Name	Prof. Dr. Sher Muhammad Doudpota/ Dr Faheem Akhtar Rajput/ Dr. Khurshid Ali
Designation	Professor – CS / Associate Professor – CS/ Assistant Professor - CS
Department	Computer Science
Last Update	Fall 2022

Computer Science/Software Engineering

Program Learning Outcomes

GA: Graduate Attributes

GA1 Computing Knowledge: An ability to apply knowledge of mathematics, science, computing fundamentals and computing specialization to the solution of complex computing problems.

GA2 Problem Analysis: An ability to identify, formulate, research literature, and analyze complex computing problems reaching substantiated conclusions using first principles of mathematics, natural sciences and computing sciences.

GA3 Design/Development of Solutions: An ability to design solutions for complex computing problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

GA4 Investigation: An ability to investigate complex computing problems in a methodical way including literature survey, design and conduct of experiments, analysis and interpretation of experimental data, and synthesis of information to derive valid conclusions.

GA5 Modern Tool Usage: An ability to create, select and apply appropriate techniques, resources, and modern IT tools, including prediction and modeling, to complex computing activities, with an understanding of the limitations.

GA6 The Computer Scientist and Society: An ability to apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional computing practice and solution to complex computing problems.

GA7 Environment and Sustainability: An ability to understand the impact of professional computing solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

GA8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of computing practice.

GA9 Individual and Team Work: An ability to work effectively, as an individual or in a team, on multifaceted and /or multidisciplinary settings.

GA10 Communication: An ability to communicate effectively, orally as well as in writing, on complex computing activities with the computing community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

GA11 Project Management: An ability to demonstrate management skills and apply computing principles to one's own work, as a member and/or leader in a team, to manage projects in a multidisciplinary environment.

GA12 Lifelong Learning: An ability to recognize importance of, and pursue lifelong learning in the broader context of innovation and technological developments