COURSE DESCRIPTION FORM

INSTITUTION National University of Computer and Emerging Sciences (NUCES-FAST)
BS(CS), BS(CY), BS(SE), BS(AI)

PROGRAM (S) TO BE EVALUATED

A. Course Description

Course Code	CS-1004
Course Title	Object-oriented Programming
Credit Hours	3+1
Prerequisites by Course(s) and Topics	Programming Fundamentals (CS-1002)
Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	**Theory:** Mid-1: 15 Mid-2: 15 Quizzes: 12 (3 total) Assignments: 8 (3 total : 2.5+2.5+3) Final: 50 **Lab:** Lab Activities: 20 (2 each and best 10) Midterm : 20 Project : 10 Final : 50

Course Coordinator	Bakhtawar Abbasi
URL (if any)	
Current Catalog Description	-
Textbook (or **Laboratory Manual** for Laboratory Courses)	**Textbook:** 1. "Problem Solving with C++", 9e Global Edition, Walter Savitch, ISBN-13:9781292018249, Addison-Wesley, 2015. 2. C++ How to program By Deitel & Deitel. **Reference books:** 1. The C++ Programming Language by Bjarne Stroustrup. 2. Object Oriented Software Engineering by Jacobson. 3. C# 4.0: The Complete Reference by Herbert Schildt
Reference Material	GCR
Course Goals	

A. Course Learning Outcomes (CLOs) with Bloom's Taxonomy Levels

1. **Discuss** knowledge of underlying concepts of object-oriented paradigm like abstraction, encapsulation, polymorphism, inheritance etc. (C-2)
2. **Identify** real world problems in terms of objects rather than procedure. (C-4)
3. **Illustrate** Object-Oriented design artifacts and their mapping to Object-Oriented Programming using C++. (C-3)
4. **Design** and assess small and medium scale C++ / C# programs using object-oriented programming principles. (C-6)
5. **Synthesize** programs using Generic Programming and exception handling. (C-6)

B. Program Learning Outcomes

1. Computing Knowledge	Apply knowledge of mathematics, natural sciences, computing fundamentals, and a computing specialization to the solution of complex computing problems.	✔
		✔

	2. Problem Analysis	Identify, formulate, research literature, and analyze complex computing problems, reaching substantiated conclusions using first principles of mathematics, natural sciences, and computing sciences.	
	3.Design/Develop Solutions	Design solutions for complex computing problems and design systems, components, and processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.	✔
	4. Investigation & Experimentation	Conduct investigation of complex computing problems using research-based knowledge and research-based methods	
	5. Modern Tool Usage	Create, select, and apply appropriate techniques, resources and modern computing tools, including prediction and modelling for complex computing problems.	
	6. Society Responsibility	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal, and cultural issues relevant to context of complex computing problems.	
	7. Environment and Sustainability	Understand and evaluate sustainability and impact of professional computing work in the solution of complex computing problems	
	8. Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of computing practice	

9. Individual and Team Work	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.	
10.Communication	Communicate effectively on complex computing activities with the computing community and with society at large.	
11. Project Management and Finance	Demonstrate knowledge and understanding of management principles and economic decision making and apply these to one's own work as a member or a team.	
12. Life Long Learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.	

C. Relation between CLOs and PLOs
(CLO: Course Learning Outcome, PLOs: Program Learning Outcomes)

		PLOs											
		1	2	3	4	5	6	7	8	9	10	11	12
CLOs	1	✔											
	2	✔											
	3		✔										
	4			✔									
	5		✔										

Topics Covered in the Course, with Number of Lectures

Week	Topic	CLO	Lab Topic	Assessment

on Each Topic (assume 15-week instruction and one-hour lectu	1	Introduction to OO paradigm	1	Introduction to IDE, skeleton of C++ program, double pointers, 2d arrays, basic I/O in C++	Assignment 1 Quiz 1 Week 3
		Comparison from procedural paradigms	1		
		Data Abstraction	1		
	2	Encapsulation	1,2	C++ data types, functions, struct revisited based on real world use cases	
		Introduction to Objects in real world	1,2		
	3	Introduction to classes and objects	1,2,3	Classes & Objects	
		Access Control	1,2,3		
		Constructors & its types, Destructor	1,3,4		
	4	Setters & Getters	1,3,4	Working with classes and Constructors, setters and getters	
		Member initialization list	1,3		
		Constants, Constants with pointers, constant functions	1,3		
	5	Static data and member functions,	1,3	Working with access modifiers, static and constant keywords, This pointer Array of objects Has-a relation	
		Inline functions, This pointer Array of objects	1,3		
	6	**Mid I Exam**			
	7	Has-a relation Introduction of Inheritance Types of inheritance	1,2,3,4	Working with Static functions, constants, constant function and member initialization list	Assignment 2 Quiz 2 Week 7 Quiz 3 Week 10
		Data and code hiding	1,2,3,4		
			1,2,3,4		
	8	Polymorphism in OOP	1,2,3,4	Inheritance	
		Function overriding and overloading	1,2,3,4		
			1,2,3,4		
	9	Friend function	1,2,3,4	Polymorphism, Function overloading and overriding	
		Operator overloading	1,2,3,4		
	10	Multiple inheritance & its issues (Diamond Problem)	1,2,3,4	Friend classes, Friend functions, operator overloading	
		Virtual inheritance	1,2,3,4		
		Virtual functions	1,2,3,4		

	11		1,2,3,4	Abstract Classes and virtual functions	
	12	Mid II Exam			
		asses & Interfaces Introduction to filing	1,2,3,4	Multiple inheritance, virtual keyword, abstract class	
	14	Filing Continue Generics	5	Project Submission & Project demo	Quiz 4
		Generics and Templates	5		
	15	Introduction to exception handling	1,2	Filing and I/O stream Working with template functions and template classes	
		STL (Vector, List)	1,2		
			1,2,4		
	16	Final lab exam			
		Final Exam			

Laboratory Projects/Experiments Done in the Course	1			
Programming Assignments Done in the Course	3 Assignments			
Class Time Spent on (in credit hours)	**Theory**	**Problem Analysis**	**Solution Design**	**Social and Ethical Issues**
	15	15	13	0
Oral and Written Communications	Every student is required to submit at least __1__ written report of typically _2__ pages and to make _1__ oral presentations of typically __10__ minute's duration. Include only material that is graded for grammar, spelling, style, and so forth, as well as for technical content, completeness, and accuracy.			

Instructor Name: Sumaiyah Zahid

Date: **20th January 2025**