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# COURSE DESCRIPTION FORM

**INSTITUTION** FAST School of Computing, National University of Computer and Emerging Sciences, Islamabad

# PROGRAM(S) TO BE EVALUATED

**BS-SE Spring 2025**

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| **Assessment Item** | **Number** | **Weight (%)** |
| Quizzes | >=5 | 10 |
| Assignments | >=3 | 6 |
| Project | 1 | 14 |

# Course Description

(Fill out the following table for each course in your computer science curriculum. A filled-out form should not be more than 2-3 pages.)

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| **Course Code** | CS-1004 |
| **Course Title** | Object-Oriented Programming (in C++) |
| **Credit Hours** | 3 |
| **Prerequisites by Course(s) and Topics** | Programming Fundamentals (CS-1002) |
| **Grading Policy** | Absolute grading scheme |
| **Policy about missed assessment**  **items in**  **the course** | Retake of missed assessment items (other than midterm/ final exam) will **not** be held.  For a missed midterm/ final exam, an exam retake/ pretake application along with necessary evidence are required to be submitted to the department secretary. The examination assessment and retake committee decide the exam retake/ pretake cases. |
| **Policy about late submission of assessment item** | Penalties for late submissions of assignment/project:   1. Up to 20 mins, loss of 20% of the mark awarded. 2. After 20 mins, assignment/project will not be accepted for marking. |
| **Course Plagiarism Policy** | Plagiarism in midterm or final exams may lead to an automatic grade of 'F' for the entire course. Plagiarism in any assignment item (including assignments and quizzes) will result in a score of zero for that category. Plagiarism in the project component will result in a score of zero for all assignment items, including assignments, quizzes, and the project itself. If the aforementioned violation occurs multiple times, the instructor reserves the right to refer the case to the Department Disciplinary Committee, where the minimum penalty may be the award of an 'F' grade for the course. |
| **Assessment Instruments with Weights** (homework, quizzes, midterms,  final, | Assessment items of **Theory Part** |

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| programming assignments, lab work, etc.) |  | Sessional – I | | | 1 | | 15 |  | | |
| Sessional – II | | | 1 | | 15 |
| Final Exam | | | 1 | | 40 |
| **Grading Policy:** Absolute grading policy will be used for this course. | | | | | |
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| **Course Instructors** | Prof. Dr. Naveed Ahmad, Dr. Muhammad Nouman Noor | | | | | | | | | |
| **Course Coordinator** | Dr. Muhammad Nouman Noor | | | | | | | | | |
| **URL (if any)** | Google Classroom Link: https://classroom.google.com/c/NzQ2MTc5MDAwMTUz?cjc=censhb7  Google Classroom Code: censhb7 | | | | | | | | | |
| **Current Catalog Description** | The course aims to provide students with the ability to analyze the given requirements for solving problems in different domains and to implement the solutions on a computer system. It mainly emphasizes applying the object-oriented programming (OOP) principles and the need to separate the interface from the implementation. The students will learn the syntax and control structures of the C++ programming language for the implementation. | | | | | | | | | |
| **Textbook** (or **Laboratory Manual** for Laboratory Courses) | Tony Gaddis “Starting Out with C++ from Control Structures to Objects” 8th Edition | | | | | | | | | |
| **Reference Material** | Paul Deitel, Harvey Deitel "C++ How to Program" 10th Edition Walter Savitch "Problem Solving with C++" 10th Edition  D. S. Malik "C++ Programming: From Problem Analysis to Program Design" 8th Edition | | | | | | | | | |
| **Course Learning Outcomes** |  | **A. Course Learning Outcomes (CLOs)** | | | | | | | |  |
| After completion of the course, the students shall be able to:  **CLOS BT PLO**   1. **Demonstrate** the basic concepts of OOP 3 1 2. **Apply** OOP concepts (Encapsulation, Inheritance, Polymorphism, Abstraction) to computing problems for the 3 2   related program   1. **Model** an algorithmic solution for a given problem using 6 3   OOP   1. **Apply** good programming practices 3 3 | | | | | | | |  |
|  | **B. Program Learning Outcomes** | | | | | | | |
|  | For each attribute below, indicate whether this attribute is covered in this course or not. Leave the cell blank if the enablement is little or non- existent. | | | | | | | |
|  |  | **PLO 1** | Computing Knowledge | | Apply knowledge of mathematics, natural sciences, computing fundamentals, and a computing specialization to  the solution of complex computing problems. | | |  |

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|  |  |  | **PLO 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. | | | | | | | | |  |  |
| **PLO 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. | | | | | | | | |
| **PLO 4** | | Investigation & Experimentation | | | | Conduct investigation of complex computing problems  using research based knowledge and research based methods | | | | | | | | |
| **PLO 5** | |  | | | | Create, select, and apply appropriate techniques, resources and modern computing tools, including prediction and  modelling for complex computing problems. | | | | | | | | |
| **PLO 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. | | | | | | | | |
| **PLO 7** | | Environment and Sustainability | | | | Understand and evaluate sustainability and impact of  professional computing work in the solution of complex computing problems | | | | | | | | |
| **PLO 8** | | Ethics | | | | Apply ethical principles and commit to professional ethics  and responsibilities and norms of computing practice. | | | | | | | | |
| **PLO 9** | | Individual and  Team Work | | | | Function effectively as an individual, and as a member or  leader in diverse teams and in multi-disciplinary settings. | | | | | | | | |
| **PLO 10** | | Communication | | | | Communicate effectively on complex computing activities  with the computing community and with society at large. | | | | | | | | |
| **PLO 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. | | | | | | | | |
| **PLO 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. | | | | | | | | |
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|  | | **C. Mapping of CLOs on PLOs**  (CLO: Course Learning Outcome, PLOs: Program Learning Outcomes) | | | | | | | | | | | | |  | |
|  | | | **PLOs** | | | | | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** |
| **CLOs** | | 1 |  |  |  |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |  |  |
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| **Topics Covered in the Course, with Number of Lectures on Each Topic** (assume 15-week instruction and one- hour lectures) |  | **Topics to be covered:** | | | |  |
| List of Topics | No. of Weeks | Contact Hours | CLO(s) |
| Memory Layout, pointers, dynamic memory allocation, stack vs. heap, pointer arithmetic, pointer vs. array, multidimensional pointers, pointer types, pointer casting (including multi- dimensional casting), char\* pointers,  alias to pointers (\*&) | **2.5** | **6** | **1** |
| Recursion, recursion for patterns and problem solving | **1** | **3** | **1** |
| Introduction to object-oriented design, class / struct keyword, member variables, member functions | **1** | **3** | **2** |
| Class constructors vs. destructors, copy constructor, overloading constructors, this pointer for function call resolution. | **1** | **4.5** | **2** |
| constant vs non-constant members, static data members and functions | **0.5** | **1.5** | **2** |
| Function overloading, introduction to operator overloading, unary and binary operators overloading, member vs. global functions for operator overloading, stream insertion and  extraction operators overloading (friend functions) | **1.5** | **4.5** | **2** |
| Identifying classes and defining relationships, introduction to composition (Association & Aggregation), separating interface from implementation | **2** | **6** | **2,3** |
| Introduction to inheritance, types of inheritance, function overriding, function  overriding vs. overloading, single vs. multiple inheritance | **2.5** | **7.5** | **2,3** |
| Introduction to polymorphism, virtual vs. non-virtual functions, abstract vs. concrete classes | **1.5** | **4.5** | **2,3** |
| Introduction to templates, template functions and template classes, C++-20 advance concept | **1** | **1.5** | **1,2,3** |
| STL | **0.5** | **0.5** | **1,2,3** |
| **Total** | **15** | **45** |  |
| **Laboratory Projects/Experiments Done in the Course** | Yes, there are lab tasks with every lab of three hours. | | | | | |

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| **Programming Assignments Done in the Course** | Yes, there are four programming assignments and a project. | | | |
| **Class Time Spent** (in hours) | **Theory** | **Problem Analysis** | **Solution Design** | **Social and Ethical Issues** |
| 34 | 5 | 5 | 1 |
| **Oral and Written Communications** | Every student is required to submit at least 1 written reports of typically 5 pages and to make 1 demonstration of typically 10 minutes duration. | | | |