**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**

1. **Course Description**

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| --- | --- | --- | --- | --- |
| **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 on Each Topic** (assume 15-week instruction and one-hour lectures) | |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **Week** | **Topic** | **CLO** | | **Lab Topic** | | **Assessment** | | 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 sequential & 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 | | | | |  | | 13 | Abstract classes & 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:**  bakhtawar abbasi

**Instructor Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Date:**