**NATIONAL UNIVERSITY** 

**of Computer & Emerging Sciences, Lahore**

Department of Computer Science

**CS-217 – Object Oriented Programming**

**Spring 2022**

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**Office Hours: Mon-Wed -10:30-11:30 a.m.**

**Course Information**

**Program:** BS (CS)

**Credit Hours:** 3 + 1 for Lab

**Type:** Core

**Class Venue:** CS - 9

**Pre-requisites:** Programming Fundamentals (CS-118)

**Course Description/Objectives/Goals:**

The core objectives of this course are to introduce,

● Object oriented programming with data abstraction and encapsulation.

● The classes, objects and relationship among different objects and classes in C++? ● Generic programming using templates, and template specializations.

**Course Learning Outcomes (CLOs):**

| **At the end of the course students will be able to:** | **Domain** | **BT\* Level** |
| --- | --- | --- |
| Understand dynamic memory management with pointers. | C | 2 |
| Understand principles of object oriented program | C | 2 |
| Identify the objects & their relationships to build object oriented solution | C | 3 |
| Model a solution for a given problem using object oriented principles | C | 3 |
| Examine an object oriented solution | C | 4 |
| \* BT= Bloom’s Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain | | |

**Course Textbooks:**

1. C++ Programming: Program Design Including Data Structures, by D. S. Malik (8th Edition) 2. C++: How to Program? by Deitle & Deitle (9th Edition)

**Additional references and books related to the course:**

3. Problem Solving with C++, by Walter Savitch

4. https://www.learncpp.com

**Course Contents Weekly and Lecture-wise Breakdown**

| **Week** | **Topic** | **Lecture-1** | **Lecture-2** |
| --- | --- | --- | --- |
| 1 | **Pointers** | Pointers Introduction, Pointer variables and Initialization, Address of Operator, Dereferencing Operator. Pointer  Operations (Relational, Arithmetic) | Use of Constant with Pointers.  Difference between a Pointer and a Reference.  Passing pointers to functions by value and by reference. |
| 2 | Dynamic memory allocation using pointers and accessing dynamic memory. Dynamic Variables new and delete operators. | Dynamic 1- dimensional arrays, Create, Delete, Grow and Shrink.  Example of programs using 1D dynamic allocation: e.g., mathematical sets union and intersection. |
| 3 | Memory Leak and Dangling Pointers, Dynamic 1- dimensional char arrays for strings, string operations like search, concatenation etc. | Pointers Indirection. Dynamic 2D,  allocation, matrices, CStrings etc. |
| 4 | **Object-oriented basics** | Structured Programming vs Object oriented Programming, Principles of modularization, abstraction and  encapsulation. | Objects vs Class, state vs behavior, access specifiers (Public, Private), Member functions (accessors, utilities, mutators etc) |
| 5 | Constructors (default, overloaded), Function overloading. | Dynamic memory allocation and Object assignment, Parameter passing, Shallow vs Deep copy, |
| **6** | **Mid Term 1** | | |
| 7 | **Object-oriented basics** | Copy constructor, Destructors, this pointer, | Cascaded function calls, static members, inline functions and other miscellaneous issues |
| 8 | **Operator**  **overloading** | Unary operators using member functions | Binary operators using member functions |
| 9 | Binary operators using non-member functions, concept of friendship, | Unary operators, Pre and post increment, subscript operator. |
| 10 | **Object and Class relationships** | Part-whole relationships,  Association/Aggregation | Composition  Implementation issues (constructor call sequence, initializer list, etc) |
| 11 | Inheritance basics, Type of Inheritance, public, protected, private. | Function Overriding and sub-typing details |
| **12** | **Mid Term 2** | | |
| 13 | **Object and Class relationships** | Polymorphism introduction Static vs dynamic binding details, virtual tables and virtual pointers, | Polymorphism vs down casting, run-time type identification, dynamic cast |
| 14 | Pure-virtual functions, Abstract classes, Interfaces (optional) | Multiple Inheritance and Diamond Problem Multiplicity, Memory Management Bi-directional relationships, Forward-class declarations issues |
| 15 | **Generic**  **Programming** | Template functions | Template classes  Template Specializations, |

| 16 | **&**  **Exception**  **Handling.** | Exception Handling. |
| --- | --- | --- |

**(Tentative) Grading Criteria:**

**1.** Assignments + Home works + Project **(20 %)**

**2.** Quizzes **(10 %)**

**3.** Midterms **(30 %)**

**4.** Final Exam **(40 %)**

● Grading scheme for this course is **Absolute** under application of CS department's grading policies.

● Minimum requirement to pass this course is to obtain at least **50%** absolute marks

**Course Policies:**

o All assignments and homework must be done individually.

o Late Submissions of assignments will not be accepted.

o No retake of announced quizzes

o **Plagiarism** in any work (Quiz, Assignment, Midterms, Project and Final Exam) from any source, Internet or a Student will result in **deduction of absolute marks or F** grade. o Minimum **80%** attendance is required for appearing in the Final exams.