**CS313 Object-Oriented Analysis and Design**

**Instructor Information**

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**TA Information**

Name: Aroosa Javed

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Location: New-4

Hours: SAT 11:30 - 14:30

**Course Information**

Prerequisite: CS201 Data Structures

Level: BS

Category: Core

Credit Hours: 3

Semester: Spring 2016

Class Venue: New-6

Class Hours: WED & FRI

CS-A: (08:30 – 09:50); CS-B (10:00 – 11:20)

Office Hours: FRI 14:00 – 16:00

**Course Objectives**

This interactive course gives a detailed overview of the basic concepts of the object-oriented (OO) paradigm such as abstraction, encapsulation, modularity, inheritance, and polymorphism. Examples (of diagrams and code) and case studies are used to illustrate these concepts and their application in real world settings. Students are also equipped with the knowledge of the Unified Modeling Language (UML) – the de facto standard for OO modeling. Furthermore, this course introduces the advanced topic of design patterns and familiarizes the students with some of the most commonly used creational, structural, and behavioral design patterns.

After studying this course, the students will be able to:

* Apply the various concepts of the OO paradigm in different phases of the software development lifecycle
* Construct OO models of real-world applications using UML
* Translate OO models to code using an OO programming language
* Design elegant programs using the concepts of design patterns

**Reference Material**

1. Object-Oriented Analysis and Design with Applications, Grady Booch et al., 3rd Edition, Pearson, 2007.
2. Object-Oriented Modeling and Design with UML, Michael R. Blaha and James R. Rumbaugh, 2nd Edition, Pearson, 2005.
3. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides, Pearson, 1995.
4. C++ How to Program, Paul J. Deitel and Harvey M. Deitel, 5th Edition, Prentice Hall, 2005.

**Course Grading (Tentative)**

* Quizzes: 10%
* Project: 20%
* Midterm Exams: 30%
* Final Exam: 40%

**[[1]](#footnote-2)Course Schedule**

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| --- | --- | --- | --- | --- |
| **S#** | **Topic** | **Week(s)** | **[[2]](#footnote-3)Readings** | **Project Deliverables** |
| 1 | Introduction: Development Lifecycle, Development Processes, Development Paradigms (Procedural, OO), Benefits of OO Paradigm | 1 | [1] Chapter 1  [2] Chapter 1 |  |
| 2 | Basic Concepts of OO Paradigm: Abstraction (Relationships: Association, Aggregation, Composition), Encapsulation, Modularity, Hierarchy (Inheritance, Polymorphism) | 2, 3 | [1] Chapter 2  [2] Chapter 2 |  |
|  | HOLIDAY (KASHMIR DAY) | 4 |  |  |
| 3 | Class Modeling: Instantiation, UML Class Diagrams, Associations, Multiplicity, Aggregation, Composition, Generalization, Abstract Classes, Reification, Constraints, Derived Data, Identification for Domain Analysis | 4, 5 | [1] Chapters 3, 4  [2] Chapters 3, 4 | Start of Week 4  Teams Formed  Start of Week 5  Project Proposal |
|  | MIDTERM EXAM 1 | 6 |  |  |
| 4 | Use Case (UC) and Activity Modeling: Actors, UC Summaries, UC Description (using a Template), UC Diagrams, UC Relationships (Include, Extend, Generalization), Activities, UML Activity Diagrams | 6, 7 | [2] 7.1, 8.1, 7.3, 8.3  [1] 5.5, 5.6 |  |
| 5 | Sequence Modeling: Scenarios, UML Sequence Diagrams (with Active, Passive, and Transient Objects) | 8 | [2] 7.2, 8.2  [1] 5.8, 5.14 | End of Week 8  Phase 1: UCs, UC Diagram, Analysis CD, Activity Diagram |
| 6 | State Modeling: Events, States, Transitions and Conditions, UML State Diagrams, Behavior, Nested States | 9 | [2] Chapters 5, 6  [1] 5.11 |  |
| 7 | OO Design: Class Design | 10 | [2] Chapter 15 |  |
|  | HOLIDAY (PAKISTAN DAY) | 11 |  |  |
| 8 | Introduction to Design Patterns: Definition, Description (using a Template), Benefits, Selection, Case Study | 11 | [3] Chapters 1, 2 | End of Week 11  Phase 2: Design CD, Design Sequence Diagram, Prototype |
| 9 | Creational Design Patterns: Factory Method | 12 | [3] Chapter 3 |  |
|  | MIDTERM EXAM 2 | 13 |  |  |
| 10 | Structural Design Patterns: Composite | 13 | [3] Chapter 4 |  |
| 11 | Behavioral Design Patterns: Observer | 14 | [3] Chapter 5 |  |
| 12 | Design Pattern Case Studies | 14 |  |  |
|  | DESIGN PATTERN PRESENTATIONS | 15 |  | End of Week 15  Phase 3: Complete Executable Application |
|  | PROJECT DEMOS | 16 |  |  |
|  | FINAL EXAM |  |  |  |

**Important Information**

**Announcements**

Announcements related to different aspects of this course (e.g. lectures, quizzes, exams, etc.) may be posted on SLATE (<http://slate.nu.edu.pk/portal>). Students are expected to view the announcements section of SLATE regularly.

**Attendance**

All students are expected to attend all lectures from beginning to end. Partial or full absence from a lecture may hamper chances for securing good grades.

**Exams**

Exams will be closed-book and closed-notes. However, students will be allowed to use a single-sided, A-4 size, hand-written help sheet for the midterm exams and a double-sided, A-4 size, hand-written help sheet for the final exam. Syllabus for the final exam will be comprehensive.

**Late-Submission**

Late submission of project deliverables is NOT allowed. Teams that do not meet the submission deadline of a deliverable will not get any credit in that particular deliverable.

**Office Hours**

Students are encouraged to take full advantage of instructor’s office hours. Any doubts regarding concepts covered in class or any questions regarding quizzes, projects, etc. may be clarified during office hours. In case a student is not able to make it during office hours, he/she may schedule an appointment with the instructor for another time slot.

**Project**

Project teams comprising 5 or 6 students will be formed by the instructor himself using a process of random selection. Projects can be chosen from any domain. Project implementation, however, must be done using C++. Further details regarding the project will be conveyed later.

**Quizzes**

Quizzes may be announced or unannounced. A quiz will usually be about 5 – 10 minutes long and it may be given anytime during the lecture. Students missing a quiz will NOT be given a make-up quiz.

**Reading Material**

Students are encouraged to finish the assigned readings BEFORE the lecture. This is likely to improve lecture comprehension and class participation.

**Revision of Grades**

Students can contest their grades on quizzes and project deliverables ONLY within a week of the release of grades. Exams will be available for review according to university policies.

**Unfair Means**

Students are expected to demonstrate the highest degree of moral and ethical conduct. Any student caught cheating, copying, plagiarizing, or using any other unfair means will be strictly dealt-with in accordance with university policies.

1. Course schedule is subject to change. [↑](#footnote-ref-2)
2. Numbers in square brackets correspond to books numbered in “Reference Material” section. [↑](#footnote-ref-3)