SE322	Software Design and Architecture (3 CH)	Fall 2025	SE

Pre-Requisite: SE211

Instructor: **Engr. Said Nabi**
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Email: said.nabi@giki.edu.pk
Office Hours: 10:30am ~ 11:30 am

Course Introduction

This course explores software design principles and architectural practices in the development of high-quality software systems. Topics include modeling with UML, architectural styles, design patterns, layered architectures, and software design tools. Students will learn to model system structure and behavior using object-oriented principles and implement systems using best design practices. A semester-long project will be developed individually or in teams applying concepts of layered architecture and design patterns.

Course Contents

The course will cover:

- Visual modeling with UML
- Object-oriented design
- Responsibility assignment using CRC Cards
- Applying design patterns
- Scalable software architecture
- Translating design into code
- Using modern design tools
- Team collaboration and ethics

Mapping of CLOs to GAs

Sr. No	Course Learning Outcomes+	Graduate Attributes (GAs)	Bloom's Taxonomy level (Cognitive domain)
CLO 1	Describe and model software systems using UML and architectural principles.	GA-3 Problem Analysis	C2 (Understanding)
CLO 2	Apply object-oriented principles and design patterns to solve software design problems.	GA-4 Design/Development of Solutions	C4 (Analyzing)
CLO 3	Demonstrate the ability to implement software designs into working code using appropriate tools, while exhibiting teamwork and professional ethics.	GA-5 Modern Tool Usage	C3 (Applying)

+Please add the prefix "Upon successful completion of this course, the student will be able to"

CLO Assessment Mechanism

Assessment tools	CLO_1	CLO_2	CLO_3
Quizzes	30%	20%	-
Assignments/Projects	10%	20%	70%
Midterm Exam	30%	30%	-
Final Exam	30%	30%	30%

Overall Grading Policy

Assessment Items	Percentage
Quizzes	12%
Project/ Assignments	18%
Midterm Exam	30%
Final Exam	40%

Text and Reference Books

Text books:

- *Craig Larman, Applying UML and Patterns*, 3rd edition.
- *Object-Oriented Systems Analysis and Design Using UML*, 4th edition.

Reference books:

- Design Patterns: Elements of Reusable Object-Oriented Software, *Erich Gamma et al.*
- Software Architecture in Practice, *4th Edition, Len Bass et al.*
- Clean Architecture, *Robert C. Martin*

Administrative Instruction

- According to institute policy, 100% attendance is *mandatory* to appear in the final examination.
- Assignments must be submitted as per instructions mentioned in the assignments.
- In any case, there will be no retake of (scheduled/surprise) quizzes.
- For queries, kindly follow the office hours in order to avoid any inconvenience.

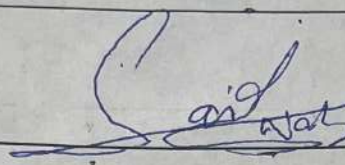
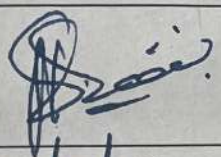
Computer Usage/Software Tool

- Use of UML tools such as Lucidchart, Visual Paradigm, StarUML .
- Use of Eclips (or any other IDE of student's choice) for assignments and projects.

Lecture Breakdown

Week 1	• Introduction to software design • Role of design in SDLC • Design process and principles • Architectural vs detailed design • Object-oriented thinking; requirements gathering & design process
Week 2	• Abstraction & encapsulation • Modeling fundamentals • UML diagrams (Class, Sequence, Use Case, Activity) • importance of modeling
Week 3	• Decomposition & generalization • Design metrics & diagrams
Week 4	• Design patterns introduction & creational patterns
Week 5	• Behavioural patterns I – Template Method & Chain of Responsibility
Week 6	• Behavioural patterns II – State, Command & Observer; MVC
Week 7	• SOLID & other principles; anti-patterns
Week 8	• Software architecture fundamentals & 4+1 view model • UML architecture diagrams
Week 9	• Architectural styles I – language-based & repository-based
Week 10	• Architectural styles II – layered, n-tier & interpreter-based
Week 11	• Architectural styles III – dataflow & event-based; process control
Week 12	• Service-Oriented Architecture fundamentals
Week 13	• RESTful services & microservices
Week 14	• Architecture evaluation & practice
Week 15	• Projects' Demo and Vivas

Version (1.0)	Fall 2025
Name of Instructor	Said Nabi

Instructor's Signature	
Date	27/08/2025
Name of HoD	Prof. Dr. Ghulam Abbas
HoD's Signature	
Date	31/8/25