NATIONAL UNIVERSITY
of Computer & Emerging Sciences, Lahore

Department of Computer Science

CS 3009 –Software Engineering

SPRING 2024

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Course Information

Program: BS **Credit Hours:** 3 **Type:** Core
Pre-requisites (if any): CS 3004 – Software Design and Analysis (SDA)
Course Website (if any): Google classroom will be used for announcements and course material
Class Venue: NB306
Exams: See Date sheet

Course Description/Objectives/Goals:

Objective of this course is to introduce the BS Computer Science (SE) students with the Software Engineering (SE) process, activities, concepts and its need. The students will be familiarized with the well- known software development process models, their key practices, and their salient features. The students will be introduced with common method (for example analysis and design diagrams such as data flow diagram, decision table etc.) to analyze and express the requirements of a moderately sized software product. The students will also be informed about the responsibilities of a Software Engineer, the steps involved in modeling of requirements, design of architecture, design of modules, programming guidelines, and testing.

Course Learning Outcomes (CLOs):

At the end of the course students will be able to:	Domain	BT* Level	PLO
1. Select an appropriate software development process for a software project	C	4	3
2. Develop a model of requirements for a software system	C	4	4
3. Design architecture of a software system by choosing the most appropriate architecture styles	C	4	4
4. Design test cases for a software system	C	4	4
5. Construct reasonable sized software in team setting	C	4	4

* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain.

Bloom's taxonomy Levels: 1. Knowledge, 2. Comprehension, 3. Application, 4. Analysis, 5. Synthesis, 6. Evaluation

Course Textbook(s)

1. Roger S. Pressman, Software Engineering A Practitioner's Approach, 9th Edition. McGrawHill
2. Shari PFleeger, Joanne Atlee, Software Engineering: Theory and Practice, 4th Edition
3. Ian Sommerville, Software Engineering, 10th Edition
4. Roger S. Pressman, Software Engineering A Practitioner's Approach, 6th Edition. McGrawHill

Additional references and books related to the course:

5. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, Fundamentals of Software Engineering, 2nd Edition. Pearson
6. Dick Hamlet, Joe Maybee, The Engineering of Software: Technical Foundations for the Individuals. Addison Wesley
7. Ivan Marsic, Software Engineering. Rutgers

Tentative Weekly Schedule

Week	Topics to be covered	Readings
1	Course Introduction. SE Introduction. Software Process Models	[1] Chapter 1, 15 [2] Chapter 1
2	Software Process Models. Systems Engineering	[1] Chapter 2, 3 [2] Chapter 2
3	Software Project Management.	[1] Chapter 24, 25 [2] Chapter 3 [3] Chapter 5
4	Requirements Engineering	[1] Chapter 7, 8 [2] Chapter 4 [4] Chapter 6, 8
5	Requirements Engineering	[1] Chapter 7, 8 [2] Chapter 4
6	**Mid I**	
7	Architecture Design	[1] Chapter 9, 10 [2] Chapter 5
8	Architecture Design	[1] Chapter 9, 10 [4] Chapter 10
9	UI Design. Detailed Design: Principles	[1] Chapter 11, 12
10	Detailed Design: Principles. Component Based Design. Component Interfaces and Module Contracts	[1] Chapter 11 [3] Chapter 17
11	Writing Programs. Testing	[2] Chapter 7, 8, 9 [3] Chapter 7, 8
12	**Mid II**	
13	Testing	[1] Chapter 19, 20
14	Testing	[1] Chapter 24, 25 [2] Chapter 3, 10
15	Delivering and Deploying the System	[1] Chapter 24, 25 [2] Chapter 3

16	Project Presentations	

Details of the topics in the tentative weekly schedule are as follows:

Software Process Models:
Waterfall, V-Model, Prototyping, Spiral, Incremental, Rapid Application Development, Unified Process, Agile (Scrum, XP). Kanban boards. Project Velocity

Systems Engineering:
Identification of objects and activities as part of the system, identifying boundary of the system to be developed

Software Project Management:
Work Breakdown Structure, Activity Graphs (Activity on Node), Determining minimum project duration using Critical Path Method, Gantt Chart. Effort and Cost Estimation, COCOMO, Object points and function points. Story Points

Requirements Engineering (RE):
Types of requirements (Functional/Non Functional), Characteristics of requirements, Testable requirements, RE activities s.a. Inception, Elicitation, Elaboration etc., Scenario based, class based, flow based, behavioral models (i.e. DFD (principles of refinement, refining from level to 2 to 3), Use case Diagram (Recap only), ER-Diagram (Recap only), State Diagram (Recap only), Sequence Diagram (Recap only), CRC cards, Class Diagram (Recap only), Swimlane diagram), Petrinets

Design:
Functional Decomposition, Architecture styles including Call-Return, Pipe-Filter, Client-Server, Peer-to- Peer, Publish-Subscribe, Repositories, Layering. Architecture Evaluation (Tradeoff analysis, cost-benefit analysis). Mapping data flow into architecture (Transaction flow, Transform flow). Component-Component Interfaces, Design by Contract, Component Diagram (Internal and External Views). Continuous integration.

Design Principles:
Modularity (Coupling, Cohesion), Interfaces, Information Hiding, Incremental Development, Abstraction, Generality.

UI Design:
Golden Rules, UID Process (Interface Analysis, Interface Design, Interface Construction, Interface Validation)

Software Testing:
Test Case Structure, White Box, Black Box. Control Flow Testing (Cyclomatic Complexity), Equivalence Class Partitioning, Boundary Value Analysis, Integration and System Testing. Acceptance Testing. Automated testing, continuous testing.

Deployment:
Deployment activities, documentation, types of users etc. Continuous delivery

(Tentative) Grading Criteria

Grading scheme: Absolute

1. Assignments + Class Activities + Project (20%)
2. 5-6 Quizzes (10%)
3. Two Midterm Exam(s) (30%)
4. Final Exam (40%)

Course Policies

1. Quizzes may be un-announced.
2. No makeup for missed quiz or assignment.
3. 80% attendance
4. Zero tolerance to plagiarism. All the parties involved will be awarded negative or Zero in first instance. Repeat of the same offense will result in (F) grade.