COMSATS University Islamabad
Department of Computer Science
Course Syllabus

Course Information

Course Code: **CSC291** | Course Title: **Software Engineering Concepts**
Credit Hours: **3(3,0)** | Lecture Hours/Week: **3**
Lab Hours/Week: **0** | Pre-Requisites: **None**

Catalogue Description:

This course introduces the different software process models by illustrating its phases and principles of software engineering. Topics include: Overview of Software Engineering; Software Process Models; Requirement Engineering Concepts; Software Design; Design Modeling; Software Quality Engineering; Software Project Management; Software Maintenance and Software Evolution.

Text and Reference Books

Textbooks:

1. Software Engineering: A Practitioner's Approach, Roger S. Pressman &Bruce R. Maxim, McGraw-Hill, 2020.
2. Engineering Software Products: An Introduction to Modern Software Engineering, Ian Sommerville, Global Edition, Pearson Education Limited, 2021.

Reference Books:

1. Software Engineering, Ian Sommerville, Pearson Education Limited, 2016.
2. Software Engineering with UML, Bhuyan Unhelkar, CRC Press, 2018.

Week wise Plan:

Lecture #	CDF Unit #	Topics Covered	Reading Material
1.	1	Nature of Software, Changing Nature of Software, Overview of Software Engineering, Professional Software Development, and Software Engineering Practice.	Pressman: Ch1
2.	1	Introduction to Software Development Life Cycle (SDLC), Process Models: Waterfall Model, Incremental Model, V-Model, and Evolutionary Development: Prototyping & Spiral Model.	Pressman: Ch2
3.	1	Agile Software Development: What is agility? Agility & the Cost of Change, Agile Process, and Agility Principles.	Pressman: Ch3 Sommerville: Ch2
4.	1	Agile Processes: Extreme programming (XP), Scrum, Kanban, and DevOps.	Pressman: Ch3 Sommerville:Ch2
5.	2	Introduction to Requirements & Requirement Engineering, and Functional & Non-Functional Requirements.	Pressman: Ch7
6.	2	Requirement Engineering Process: Requirements Discovery Techniques, and Validation.	Pressman: Ch7
7.	2	Requirements Gathering through Features, Scenarios, and User Stories.	Sommerville: Ch3
8.	2	Requirements Modeling: Scenario-Based Modeling.	Pressman: Ch8
9.	2	Requirements Modeling: Class-based Modeling, and Functional Modeling.	Pressman: Ch8

10.	2	Requirements Modeling: Behavioral Modeling.	Pressman: Ch8
11.	3	Design Process, Design Concepts, and Design Models.	Pressman: Ch9
12.	3	Architectural Styles and Properties; Architecture Types: Pipes & Filters, 2-Tiered (Client/Server), 3-Tier, N-Tiered & Layered Architecture, Model View Controller (MVC), and Repository Architecture.	Pressman: Ch10 Sommerville: Ch4
13.	3	Object-Oriented Design using the UML, Object-Oriented Decomposition, and Behavioral Models (Use Case Diagram, Activity Diagram, and State Machine Diagram).	Ref. Material
14.	3	Structural Models (Class Diagram, Object Diagram, and Package Diagram).	Ref. Material
15.	3	Structural Models (Deployment Diagram, Composite Structure Diagram, and Component Diagram).	Ref. Material
16.	**Mid Term Exam**		
17.			
18.	3	Interaction Models (Sequence Diagram, and Communication Diagram).	Ref. Material
19.	3	Structured Analysis Modeling, Data Model: Entity Relationship Diagram (ERD), and Data Model: Data Flow Diagram (DFD): Introduction, and Level 0.	Ref. Material
20.	3	Data Flow Diagram (DFD): Level 1, and Level 2.	Ref. Material
21.	4	Software Quality Concepts, Software Quality Dilemma, and Achieving Software Quality.	Pressman: Ch 15
22.	4	Cost Impact of Software Defects, Review Matrices, Criteria for Reviews, Informal Reviews, and Formal Technical Reviews.	Pressman: Ch 16
23.	4	Software Quality Assurance (SQA), SQA Processes, Tasks, Goals and Metrics, Formal Approaches to SQA, and Software Reliability.	Pressman: Ch 17
24.	4	Software Testing, Test Case Design, White Box & Black Box Testing Techniques, and Object-Oriented Testing.	Pressman: Ch 19
25.	4	Integration Level Testing, Regression Testing, Integration Testing in OO Context, and Validation Testing.	Pressman: Ch 20
26.	4	Testing Patterns, Specialized Testing for Mobility, Testing Strategies, and User Experience Testing & its Issues.	Pressman: Ch 20 Pressman: Ch 21
27.	4	Web Application Testing, Web Testing Strategies, Security Testing, and Performance Testing.	Pressman: Ch 21
28.	4	Real Time Testing, Testing AI Systems, Testing Virtual Environments, and Testing Documentation.	Pressman: Ch 21
29.	5	Software Project Management Concepts, People, Product, Process, and Project.	Pressman: Ch 24
30.	5	Software Plan, Project Planning Process, Software Feasibility & Estimation Techniques, and Project Scheduling.	Pressman: Ch 24
31.	6	Software Maintenance, Maintenance Tasks, Maintenance Types, and Reverse Engineering.	Pressman: Ch 27
32.	6	Software Evolution, Inventory Analysis, Document Restructuring,	Pressman: Ch 27

		Refactoring, and Forward Engineering.	
Final Term Exam			

Students Outcomes(SOs)

S.#	Description
1	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements
2	Identify, formulate, research literature, and solve *complex* computing problems reaching substantiated conclusions using fundamental principles of mathematics, computing sciences, and relevant domain disciplines
3	Design and evaluate solutions for *complex* computing problems, and design and evaluate systems, components, or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations
4	Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to *complex* computing activities, with an understanding of the limitations

Course Learning Outcomes (CLO)

Sr.#	Unit #	Course Learning Outcomes	Blooms Taxonomy Learning Level	SO
CLO-1	1	Explain the concept of software engineering along with its processes and deliverables.	*Understanding*	1
CLO-2	2	Identify functional and non-functional requirements for a medium sized software system.	*Analyzing*	2
CLO-3	3	Construct appropriate design models for the structure and behavior of a medium sized software system.	*Applying*	2-4
CLO-4	4	Apply software testing and quality assurance techniques to medium sized software.	*Applying*	2,4
CLO-5	5-6	Demonstrate software project management skills and maintenance process.	*Applying*	2,4

CLO Assessment Mechanism

Assessment Tools	CLO-1	CLO-2	CLO-3	CLO-4	CLO-5
Quizzes	Quiz 1	Quiz 2	Quiz 3	Quiz 4	-
Assignments	-	Assignment 1	Assignment 2	Assignment 3	Assignment 4
Mid Term Exam	Mid Term Exam	Mid Term Exam	Mid Term Exam	-	-
Final Term Exam	Final Term Exam				

Policy & Procedures

- **Attendance Policy:** Every student must attend 80% of the lectures as well as laboratory in this course. The students falling short of required percentage of attendance of lectures/laboratory work, is not allowed to appear in the terminal examination.

- **Course Assessment:**

	Quizzes	Assignments	Mid Term Exam	Terminal Exam	Final Marks
Theory (T)	15	10	25	50	100

- **Grading Policy:** The minimum passing marks for each course is 50% (In case of LAB; in addition to theory, student is also required to obtain 50% marks in the lab to pass the course). The correspondence between letter grades, credit points, and percentage marks at CUI is as follows:

Grade	**A**	**A-**	**B+**	**B**	**B-**	**C+**	**C**	**C-**	**D+**	**D**	**F**
Marks	>= 85	80 - 84	75 - 79	71 - 74	68 - 70	64 - 67	61 - 63	58 - 60	54 - 57	50-53	< 50
Cr. Point	3.67-4.00	3.34-3.66	3.01-3.33	2.67-3.00	2.34-2.66	2.01-2.33	1.67-2.00	1.31-1.66	1.01-1.30	0.10-1.00	0.00

- **Missing Exam:** No makeup exam will be given for final exam under any circumstance. When a student misses the mid-term exam for a legitimate reason (such as medical emergencies), his grade for this exam will be determined based on the Department policy. Further, the student must provide an official excuse within one week of the missed exam.

- **Academic Integrity:** All CUI policies regarding ethics apply to this course. The students are advised to discuss their grievances/problems with their counsellors or course instructor in a respectful manner.

- **Plagiarism Policy:** Plagiarism, copying and any other dishonest behaviour is prohibited by the rules and regulations of CUI. Violators will face serious consequences.