NATIONAL UNIVERSITY
of Computer & Emerging Sciences, Lahore

F A S T   S c h o o l   o f   C o m p u t i n g

SE3002 – Software Quality Engineering

FALL 2025

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Course Information

Program: BS (SE)
Credit Hours: 3
Type: Core
Pre-requisite: SE1001 Introduction to Software Engineering
Course Website: Google Classroom
Class Meeting Days: Wednesday and Friday
Class Meeting Time: 0830 – 0950 (BSE-5A); 1000 – 1120 (BSE-5B)
Class Venue: F-207

Course Objectives

This course provides a comprehensive coverage of different aspects of software quality assurance (SQA). Apart from the conventional discussion on SQA activities during the project life-cycle (e.g. reviews, testing, etc.), it includes a discussion about pre-project components (e.g. contract review), infrastructure components (e.g. configuration management), and management components (e.g. quality metrics).

Course Learning Outcomes (CLOs)

CLO #	CLO description	BT Cognitive Level	PLO #
CLO 1	**Explain** different views of quality	2 (Understanding)	PLO 1
CLO 2	**Describe** the fundamentals of measurement theory	2 (Understanding)	PLO 1
CLO 3	**Understand** the use of software quality related metrics in Software Quality Engineering	2 (Understanding)	PLO 2
CLO 4	**Use** quality management tools	3 (Applying)	PLO 5

Relevant Program Learning Outcomes (PLOs)

PLO #	PLO Name	PLO Description
PLO 1	Software Engineering Knowledge	To apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex Software Engineering problems.
PLO 2	Problem Analysis	Identify, formulate, research literature, and analyze complex computational problems, reaching substantiated conclusions using first principles of mathematics, natural sciences, computing, and Software Engineering.
PLO 5	Modern Tool Usage	Create, select, and apply appropriate techniques, resources and modern Computer-Aided Software Engineering (CASE) tools, including prediction and modelling for complex computing problems.

Reference Material

1. Software Quality Assurance: From Theory to Implementation, Daniel Galin, 1st Edition, Pearson Education, 2004.
2. Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, Jeff Tian, 1st Edition, Wiley-IEEE Computer Society Press, 2005.
3. Software Engineering: A Practitioner's Approach, Roger S. Pressman, 6th Edition, McGraw-Hill, 2005.
4. Software Metrics: A Rigorous & Practical Approach, Norman E. Fenton and Shari Lawrence Pfleeger, 2nd Edition, PWS Publishing Company, 1997.

Course Grading (Tentative)

- Assignments   10%
- Quizzes: 10%
- Project: 10%
- Midterm Exams: 30%
- Final Exam: 40%

Absolute grading scheme will be used for this course.

Tentative Course Schedule

S#	Topic	Week(s)	[1]Readings
1	INTRODUCTION AND OVERVIEW Definitions of Software, Quality, and Engineering History of SE Role of Software Importance of Software Quality	1	[1] Chapter 1
2	BASIC SOFTWARE QUALITY CONCEPTS Software Quality Software Quality Problems & Causes Software Quality Assurance Software Quality Control	2	[1] Chapter 2 [3] Chapter 26 (26.1)
3	SOFTWARE QUALITY FACTORS McCall's Factor Model - Operation Factors, Revision Factors, Transition Factors Alternative Factor Models	2, 3	[1] Chapter 3
4	COMPONENTS OF SQA SYSTEM SQA Architecture Pre-project Components Life-cycle Components Infrastructure Components Management Components Standards-related Components Human Components Considerations Affecting Use of SQA System Components	3	[1] Chapter 4
5	INTEGRATION OF SQA ACTIVITIES Software Processes Factors Affecting Intensity of SQA Activities	4, 5	[1] Chapter 7 [3] Chapters 3 & 4

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[1]Numbers in square brackets correspond to books numbered in the "Reference Material" section.

	Verification, Validation, and Qualification		
	Software Defect Removal Effectiveness and Cost Model		
6	PRE-PROJECT COMPONENTS Contract Review	5	[1] Chapter 5
	MIDTERM EXAM 1	6	
7	REVIEWS Formal Technical Reviews (FTRs) Peer Reviews – Inspections and Walkthroughs Expert Opinions	6	[1] Chapter 8 [2] Chapter 14 [3] Chapter 26 (26.4)
8A	SOFTWARE TESTING – BASIC CONCEPTS & STRATEGIES Definition and Objectives Unit Testing Integration Testing – Big Bang, Incremental (Bottom-up, Top-down) Validation Testing System Testing Regression Testing Smoke Testing Alpha and Beta Testing UAT	7	[1] Chapter 9 [3] Chapter 13
8B	SOFTWARE TESTING – TEST CLASSIFICATIONS W. R. T. Testing Concept – BB, WB W. R. T. Quality Factors – Operation (Correctness, Reliability, Efficiency, Integrity, Usability), Revision (Maintainability, Flexibility, Testability), Transition (Portability, Reusability, Interoperability)	8	[1] Chapter 9
8C	SOFTWARE TESTING – TECHNIQUES White Box – Code Coverage (Line, Branch, Path), Basis Path Testing (Control Flow Graph, Cyclomatic Complexity), Loop Testing, Condition Testing, Qualification Testing	8, 9, 10	[1] Chapter 9 [3] Chapter 14

	Black Box – Equivalence Class Partitioning (ECP), Boundary Value Analysis (BVA) Advantages and Disadvantages		
8D	SOFTWARE TESTING – IMPLEMENTATION Testing Process Test Case Design Automated Testing Debugging	11, 12	[1] Chapter 10 [3] Chapter 13
	MIDTERM EXAM 2	12	
8E	SOFTWARE TESTING – OO SOFTWARE Strategies Techniques	12	[3] Chapters 13 & 14
9	SOFTWARE CONFIGURATION MANAGEMENT Terminology SCM Tasks Change Control Release Management	13	[1] Chapter 18 [3] Chapter 27
10	MEASUREMENT THEORY Importance of Measurement Measurement Scales	13	[4] Chapters 1 and 2
11	SOFTWARE QUALITY METRICS Size Metrics Process Metrics Product Metrics Implementation Limitations	14	[1] Chapter 21
	PROJECT PRESENTATIONS	15, 16	
	ADVANCED TOPICS (May be Covered if Time Permits) Statistical SQA (Six Sigma) Formal Approaches to SQA		

	Test Driven Development		
	FINAL EXAM		

Course Policies

1. Announcements related to different aspects of this course (e.g. lectures, quizzes, exams, etc.) may be posted on Google Classroom. Students are expected to view the Google Classroom Stream regularly.
2. All students are expected to attend all lectures from beginning to end. Partial or full absence from a lecture without a valid reason may hamper chances for securing good grades. University's attendance requirements must be met in order to appear in the final exam.
3. Exams will be closed-book and closed-notes. Syllabus for the final exam will be comprehensive.
4. 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.
5. Quizzes may be announced or unannounced. A quiz will usually be about 5 – 15 minutes long and it may be given anytime during the lecture. Students missing a quiz will NOT be given a make-up quiz.
6. Students are encouraged to finish the assigned readings BEFORE the lecture. This is likely to improve lecture comprehension and class participation.
7. Students can contest their grades on quizzes, assignments, and project ONLY within a week of the release of grades. Exams will be available for review according to university policies.
8. 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.