



Software Quality Engineering

Course Code:	SE 321	Semester:	Spring 2017
Credit Hours:	3+0	Prerequisite Codes:	SE-200 Software Engineering (3+0)
Instructor:	Ayesha Kanwal	Class:	BE-SE 5A B
Office:	A- 205	Telephone:	051.90852184
Lecture Days:	Wed Thursday and Friday	E-mail:	Ayesha.kanwal@seecs.edu.pk
Class Room:		Consulting Hours:	Mon, Fri 2pm – 3pm (or by appointment)
Lab Engineer:	None	Lab Engineer Email:	N/A
Knowledge Group:	Software Engineering	Updates on LMS:	Weekly

Course Description:

The Software Quality Engineering course emphasizes on software quality: how QA activities fit into the overall software development life cycle, the kind of QA practices implemented by practitioners, different types of testing techniques and how to choose the best one in a given situation. It also focuses on software quality metrics, how we can manage the risks associated with software quality that threaten our project's success, and what are the ways of approaching software development process improvement in a systematic way.

Course Objectives:

Following key questions that will be answered by taking this course:

What is quality? What is software quality? How do QA activities fit into the overall software development life cycle? What kinds of QA practices are out there? What are the different types of testing techniques? And how should I choose between them? What kinds of quality metrics are useful? How do we manage the risks associated with software quality that threaten our project's success? How can I approach software development process improvement in a systematic way?

Course Learning Outcomes (CLOs):

At the end of the course the students will be able to:	PLO	BT Level*
1. Understand the key knowledge areas of Software Quality Engineering and its application in the software development lifecycle.	1	C-3
2. Apply modern software testing processes and techniques.	3	C-4
3. Create and execute test strategies and plans	4	C-4
* BT= Bloom's Taxonomy, C=Cognitive domain , P=Psychomotor domain, A= Affective domain		



Mapping of CLOs to Program Learning Outcomes

PLOs/CLOs	Level of Emphasis of PLO (1: High, 2: Medium, 3: Low)	CLO1	CLO2	CLO3
PLO 1 (Engineering Knowledge)	1	√		
PLO 2 (Problem Analysis)	1		√	
PLO 3 (Design/Development of Solutions)	1		√	
PLO 4 (Investigation)				
PLO 5 (Modern tool usage)				
PLO 6 (The Engineer and Society)				
PLO 7 (Environment and Sustainability)				
PLO 8 (Ethics)				
PLO 9 (Individual and Team Work)	2			√
PLO 10 (Communication)	2			√
PLO 11 (Project Management)				
PLO 12 (Lifelong Learning)				

Mapping of CLOs to Assessment Modules and Weightages (In accordance with NUST statutes)

To be filled in at the end of the course.

Assessments/CLOs	CLO1	CLO2	CLO3
Quizzes: 10%			
Assignments: 10%			
OHT-1: 15%			
OHT-2: 15%			
Project:10%			
End Semester Exam:40%			
Total : 100 %			

Books:

Text Book: Tian, Jeff (2005). Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement | ISBN-10: 0471713457 | ISBN-13: 978-0471713456 | Edition: 1

Reference Books: Nina S Godbole (2004). Software Quality Assurance: Principles and Practice | ISBN-10: 1842651765 | ISBN-13: 978-1842651766
Paul C. Jorgensen (2002). Software Testing, A Craftsman's Approach, CRC Press | ISBN-10: 0849308097 | ISBN-13: 978-0849308093 | Edition: 2
Stephen H. Kan (2002). Metrics and Models in Software Quality Engineering, Addison-Wesley Professional | ISBN-10: 0201729156 | ISBN-13: 978-0201729153 | Edition: 2

Reading List Some of the lectures will require the students to read the following papers before coming to class. The instructor will announce in the class which papers will be discussed in the next class.

- David N. Wilson, and Tracy Hall (1998) Perceptions of software quality: a pilot study, Software Quality Journal 7, (1998) 67–75.
- Mark C. Paulk, Bill Curtis, Mary Beth Chrissis, and Charles V. Weber, The Capability Maturity Model for Software, http://moosehead.cis.umassd.edu/cis365/reading/CMM_for_Software.pdf



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3. G.J. van der Pijl, G.J.R Swinkels, and J.G. Verrijdt (1997) ISO 9000 versus CMM: Standardization and certification of IS development, Information & Management 32 (1997) 267-274
4. Brian Marick, Classic Testing Mistakes, <http://www.csi-chennai.org/swtws/ws-swt/mistakes.pdf>
5. David Talby and Arie Keren, and Orit Hazzan and Yael Dubinsky, (2006) Agile Software Testing in a Large-Scale Project Large-Scale Project, IEEE SOFTWARE, July/ August, 30-37.

Topics to be Covered:

1. Software quality and quality assurance
2. Quality processes and standards: ISO Standards, CMMI, TQM
3. Testing concepts, issues, types and techniques
4. Test activities, management, and automation
5. Software inspection
6. Comparison of various QA techniques
7. Quantifiable quality improvement: defects and risk identification
8. Defect analyses
9. Defect removal models
10. Software reliability, failures and faults

Lecture Breakdown:

Week	Date	Topics Part 1: Fundamentals of Software Quality, Processes and Standards
1	13 th Feb	Course Introduction Understanding Quality
2	20 th Feb	Software Quality and Quality Assurance Various Dimensions of Software Quality Quality Assurance Measures
3	27 th Feb	TQM and Software Quality What is TQM TQM and SPM Best Practices
4	6 th March	Software Development Process and Models: ISO Standards What is ISO 9000, ISO 12207, ISO 15504, ISO 9126 ISO requirements How to use ISO 9000, 9000-3, Cost and Benefits
5	13 th March	Software Development Process and Models: Capability Maturity Model Integration Process Focus What is CMM Levels of CMM CMM vs. CMMI
6	20 th Mar	OHT-1 Part 2: Software Testing and Validation
7	27 th Mar	Testing: Concepts, Issues, and Techniques What is testing? What is verification? What is validation? Why testing? Major testing activities and techniques When to stop testing?
8	3 rd April	Test Activities, Management, and Automation Test Planning and prep Test Execution, and result measurement Test analysis follow up Classic Testing Mistakes



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9	10 th Apr	Coverage and Usage Testing Checklist based testing Usage based statistical testing Agile Software Testing
10	17 th Apr	Topics in Testing, FSM testing, Load testing Open source tools in testing Software Inspection Fagan inspection process Overview of Formal Verification
11	24 th Apr	Basic concept Axiomatic approach Quantifiable Quality Improvement: Defects Classification
12	1 st May	OHT-2 Part 3: Software quality matrices, fault tolerance and Advance topics
13	8 th May	Fault Tolerance and Containment Recovery blocks N-Version Programming Failure containment
14	15 th May	Comparing QA Techniques Effectiveness comparison Cost comparison Quantifiable Quality Improvement: Risk Identification
15	22 nd May	Advance topics in Software quality Engineering (e.g Quality in Cloud computing and mobile computing) Future research areas related to Software quality engineering
16	29 th May	Advance topics in Software quality Engineering (e.g Quality in Cloud computing and mobile computing) Future research areas related to Software quality engineering
17	5 th June	Projects Presentations
18	12 th June	ESE

Term Project: Students will be required to research and present a topic/ research paper related to the course. You will be in a group of 3 to 4 students. Details of these deliverables will be shared with you in the class.

Deliverable 01: Project Plan

Deliverable 02: Test Cases

Deliverable 03: Bug Report

Deliverable 04: Demonstration

Grading Policy:

Quiz Policy: The quizzes will be unannounced and normally last for ten minutes. The question framed is to test the concepts involved in last few lectures. Number of quizzes that will be used for evaluation is at the instructor's discretion.

Assignment Policy: In order to develop comprehensive understanding of the subject, assignments will be given. Late assignments will not be accepted / graded. All assignments will count towards the total (No 'best-of' policy). The students are advised to do the assignment themselves. Copying of assignments is highly discouraged and violations will be dealt with severely by referring any occurrences to the disciplinary committee. The questions in the assignment are meant to be challenging to give students confidence and extensive knowledge about the subject matter



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and enable them to prepare for the exams.

Email Policy: I will be available via email for any queries. The email reply time will be 24 hours, excluding weekends and public holidays.

Plagiarism: SEECs maintains a zero tolerance policy towards plagiarism. While collaboration in this course is highly encouraged, you must ensure that you do not claim other people's work/ ideas as your own. Plagiarism occurs when the words, ideas, assertions, theories, figures, images, programming codes of others are presented as your own work. You must cite and acknowledge all sources of information in your assignments. Failing to comply with the SEECs plagiarism policy will lead to strict penalties including zero marks in assignments and referral to the academic coordination office for disciplinary action.