Course Outline

<table>
<tr><td><b>Title</b></td><td><b>Software Quality Assurance</b></td></tr>
<tr><td><b>Code</b></td><td><b>SE - 493</b></td></tr>
<tr><td><b>Credit Hours</b></td><td>3
<i><b>Theory/week:</b></i>
Weight 3 Cr. Hrs.
Contact Hours 3 Hrs.
Lectures: 2
Duration 1.5 Hrs.
<i><b>Lab/week:</b></i>
Weight 3 Cr. Hrs.
Contact Hours 0 Hrs.
Labs. 2
Duration 3 Hrs.</td></tr>
<tr><td><b>Prerequisite</b></td><td><b>NILL</b></td></tr>
<tr><td><b>Prerequisite Skill/Knowledge/Understanding</b></td><td>SE-I and SE-II</td></tr>
<tr><td><b>Required Study Hours</b></td><td>
<table>
<tr><th>TEACHING, LEARNING + ASSESSMENT ACTIVITIES</th><th>STUDY HOURS</th></tr>
<tr><td>32 x 1.5“ hr lectures</td><td>48</td></tr>
<tr><td>Lab activity / tutorials / presentations</td><td>3</td></tr>
<tr><td>Regular student’ Centered learning</td><td>47</td></tr>
<tr><td>Net Surfing</td><td>10</td></tr>
<tr><td>In’ course practical assignment(s)</td><td>4</td></tr>
<tr><td>In’ course writing assignment(s) 4 x 1.5 hrs</td><td>6</td></tr>
<tr><td>Preparation term examination + viva</td><td>24</td></tr>
<tr><td>Term examination + viva</td><td>8</td></tr>
<tr><td>Total</td><td>150</td></tr>
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<tr><td><b>Follow Up</b></td><td><b>-None-</b></td></tr>
<tr><td><b>Program Name</b></td><td>BS in Computer Science / Software Engineering / Information Technology</td></tr>
<tr><td><b>Category</b></td><td>Software Engineering – (Specialization)</td></tr>
<tr><td><b>Aims and Objectives</b></td><td>• Understanding of Software Quality Assurance domain and its sub domains (SQE, SQA and SQC)
• Defining, implementing, measuring the performance and improving the QA Processes
• Planning the QA activities (Software Quality Assurance Planning)
• Planning and executing the testing activities (manual and automated)
• Organization standardization, different standards (CMM, CMMI, ISO, Six Sigma etc)</td></tr>
<tr><td><b>Learning Outcomes</b></td><td>This course will enable students to apply appropriate Software Quality Assurance standards, procedures and practices in a given application domain.</td></tr>
<tr><td><b>Syllabus</b></td><td>Topics: Introduction to Software Quality Assurance; Software Quality in Business Context; QA, QC and QE; Product Quality and Process Quality; Software Quality Measurement and Metrics; Personal Software Process; Walkthroughs and Inspections; Software Configuration Management; Quality System Documentation; Software Testing Techniques; Software Testing Strategies; Automated Testing; Capability Maturity Model; CMM-Integration, People-CMM; ISO; Six Sigma; Testing Tools, Trends and Perspectives.</td></tr>
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<tr><td><b>Text Book/s</b></td><td>A. See reference material</td></tr>
<tr><td><b>Pedagogical Strategies</b></td><td>• Collaborative and cooperative learning
• Discussion groups and seminars
• Labs
• Demonstrations
• Ongoing reflection
• Self-evaluation</td></tr>
<tr><td><b>Reference Material</b></td><td>A. Software Engineering 6th edition by Ian Sommerville
B. Software Inspections by Gilb and Graham
C. Software Engineering: A Practitioners Approach by Roger S. Pressman
D. PSP-BOK
E. The Art of Software Testing 2nd edition by Mayer
F. Software Quality: State of the Art in Management, Testing, and Tools by Martin Wieczorek
G. SEI, IEEE, NASA and DoD Models and Standards
H. Material at lecture notes (www.lectures.pucit.edu.pk)</td></tr>
<tr><td><b>Instructional Aids/Resources</b></td><td>• Class facilities to Instructor and students for Lectures per Room
o 1 Network enabled PC
o 1 Multimedia
o 1 Whiteboard
o 1 Rostrum
o 1 Board marker/Month i.e. 4 Week Lectures (eight sessions)
o Max 45 students sitting facility
o CASE tools must be available in the lecture room as well as in labs.

• Evaluation and Support facilities
▪ Announced Testes i.e. pre mid and pre final Testes should not be conducted during class hours

• Photocopy facility for different Handouts
o Subject description document that includes student version of course outline, prerequisite test and its solution should be distributed in first class.
o Handout: - Required handouts as mentioned in lecture framework
o Quizzes and Solution: - Quizzes and their standard solution must be provided to students in handout form after each quiz.
o Case Studies and Tutorials: - Description of case study and handout of each tutorial should be provided.</td></tr>
<tr><td><b>Assessment Criteria</b></td><td><table>
<tr><th>Sessional</th><th>25%</th><th>Mid</th><th>35%</th><th>Final</th><th>40%</th><th>Total</th><th>100%</th></tr>
<tr><td>Quizzes and Test</td><td>15</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Assignment</td><td>10</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>Paper</td><td>35</td><td>Paper</td><td>40</td><td></td><td></td></tr>
<tr><td><b>Total:</b></td><td><b>25</b></td><td></td><td><b>35</b></td><td></td><td><b>40</b></td><td><b>= 100</b></td><td></td></tr>
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<tr><td><b>Recommendations</b></td><td>NILL</td></tr>
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Framework

Week	**Lecture**	**Topic**	**Source** (Book-Chapter No. Section No.)	**Recommendations for Learning Activities** (Mention Assignments, Test, Case Study, Projects, Lab Work or Reading Assignments)
1	1	Introduction to Software Quality Assurance, The Meaning of Quality: Defining Quality, The Quality Challenge, Why is quality important		
	2	Software Quality in Business Context; Software Quality Control (SQC) Software Quality Assurance (SQA) and Software Quality Engineering (SQE)		
2	3	Precision, Accuracy, Grade, Continuous Improvement, Quality Leader		
	4	Product Quality and Process Quality; Software Process and Product Quality, Introduction to Quality Standards (CMMI, Six Sigma, ISO)		
3	5	8 quality principles by ISO		
	6	SQA and SDLC		
	7	Software Quality Measurement and Metrics: Overview, Introduction, Measurement during Software lifecycle context		
4	8	7 Quality Control Tools		
	9	7 Quality Control Tools		
5	9	Software Reviews: Buddy Checking, Desk Checking, Walkthroughs and Inspections: Overview and Introduction		
	10	Inspections Process Definition, Various Roles and Responsibilities involved in Inspections, Some Psychological Aspects of Reviews		
6	11	Inspection Metrics: Measurement of Inspection Process efficiency, improving the process; Reviewer's		
	12	Inspection Log; Inspection Summary Form etc. Introduction of some Defect Repotting Tool		
7	13	Software Configuration Management: Overview, Configuration Management Process, Why SCM? Software Configuration Management Activities		
	14	Software Configuration Management Activities (continued), SCM Process implementation, SCM Forms (change request forms, history forms etc)		
8	15	SCM Tool: Microsoft VSS (LAB)		
	16	Pre Mid Review		
9	17	Software Testing: Introduction and its basics, Who should do the testing? Test case designing		
	18	Creating Software Testing Plan, Test reporting, When to stop testing?		
10	19	Software Testing Techniques vs. Software Testing Strategies Software Testing Techniques: Introduction to White Box Testing and its techniques: Basis Path Testing, Condition Testing, Data Flow Testing, Loop Testing		
	20	Basis Path Testing: Flow Graph Notation, Cyclomatic Complexity, Basis Paths identification, designing the test cases against each path		
11	21	Adequacy of White-box and Black-box Testing, Introduction to Black-box Testing, introduction to different techniques: Graph-Based Testing Equivalence Partitioning, Boundary Value Analysis, Comparison Testing, Orthogonal Array Testing etc.		
	22	Continue: Equivalence Partitioning, Boundary Value Analysis, some examples and exercises		

12	23	Software Testing Strategies: Introduction, V-Model and W-Model Introduction to different strategies like Unit testing, Integration Testing etc.		
	24	System Testing, Acceptance Testing, Verification and Validation and System Testing, Acceptance Testing vs. Verification and Validation		
13	25	Automated Testing: introduction, pluses and minuses of Manual Testing, Why Automated Testing, Introduction to WinRunner 7.0, Basic language structure		
	26	Introduction to WinRunner 7.0 continued: Data types, looping, branching, built in functions.		
14	27	WinRunner LAB		
	28	Organization Standardization, why and how. Capability Maturity Model: Definition, History, Structure, CMM levels, Key Process Areas.		
15	29	CMM- integration: What is CMM-I, Background, Types of CMM-I Models		
	30	Transiting to CMM-I Models, Process Maturity levels, Choosing a CMM-I Models Representation, Comparison of SW CMM and CMM-		
16	31	Course Review and Final Project Presentations		
	32	Final Project Presentations		